SELECTED WATER RESOURCES ABSTRACTS

VOLUME 3, NUMBER 20
OCTOBER 15, 1970

W70-08149 -- W70-08584

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

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Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources. WRSIC is not presently prepared to furnish loan or retention copies of the publications announced.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas. Centers, and their subject coverage, now in operation are:

- Ground and surface water hydrology at the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.

- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Research Institute of Rutgers University.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the FWPCA, Soap and Detergent Association, and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.

In cooperation with the Federal Water Pollution Control Administration, the following "centers of competence" have been established:

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Textile wastes pollution at the School of Textiles of North Carolina State University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangement of this bulletin are welcome.

Water Resources Scientific
Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
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SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

HERMAL POLLUTION - BIOLOGICAL EFCTS, A REVIEW OF THE LITERATURE OF 69,
ttelle-Northwest, Richland, Wash.
r primary bibliographic entry see Field 05C.
70-08376

HE EFFECTS OF SUSPENDED AND EPOSITED SEDIMENTS ON ESTUARINE ORANISMS; AN ANNOTATED BIBLIOGRAPHY F SELECTED REFERENCES,
aryland Univ., Solomons. Natural Resources Inst.
r primary bibliographic entry see Field 05C.
70-08386

1A. Properties

HEORY OF LIQUIDS,
aterloo Univ. (Ontario).
ouglas Henderson, and J. A. Barker.
or sale by Superintendent of Documents, US overnment Printing Office, Wash, DC 20402 - rice $0.50. Office of Saline Water Research and evelopment Progress Report No 537, March 970. 40 p, 12 fig, 2 tab, 28 ref. OSW Grant No 14-1-0001-1325.

escriptors: *Water properties, *Water structure, Liquids, Molecular structure, Mechanical proper-es, Thermodynamic behavior, Viscosity.
dentifiers: Theory of liquids.

wo theories of simple spherical liquids are eviewed. These are perturbation theory and the ercus-Yevick (PY) theory. When used properly hese theories are of comparable accuracy and are ery satisfactory theories of liquids. Progress in the etermination of intermolecular forces is discussed nd recent work on the theory of water is reviewed. he fundamental concepts of the perturbation heory of liquids are that the structure of a simple iquid is determined primarily by the repulsive orces between the molecules and that the main ef-ect of the attractive forces between the molecules s to provide a uniform background potential in which the molecules move. (Knapp-USGS)
W70-08510

CURRENT STATE OF THE PROBLEM OF WATER STRUCTURE,
Yu. V. Gurikov.
n: Water in Biological Systems Consultants Bureau, New York, p 1-8.

Descriptors: *Water structure, *Hydrogen bonding, *Molecular structure, *Physicochemical properties, Ice, Thermodynamic behavior, Aqueous solutions, X-ray analysis.
Identifiers: *Framework structure, *Clathrate framework, *Framework voids, *Bond-rupture process, Cold neutron scattering, Raman spectrun, Valence-vibration spectrum, Dodecahedral structure, Molecular orientation.

Compared to other liquids the physicochemical properties of water are highly unusual. The structure of water is of great importance with respect to those properties, and framework defects have been recognized as a special component of water structure. Recent studies on framework structure are reviewed, and the principle concepts to emerge from these studies are: (1) The great similarity of water and ice structures (2) The rupture of H-bonds with temperature increase (3) Two types of H-bond (centrosymmetric and mirror-symmetric) (4) Dodecahedral structure formation of the clathrate type (5) Characteristic temperature near which there are abrupt changes in the properties and structure of water. Framework defects, ranging from bending of bonds to complete rupture, are relatively unimportant in ice but become an important structural component in the liquid state. Two types of structural models of water are discussed: (1) Mosaic models in which water is treated as an ideal mixture of segments having an ice-like structure and segments with a more compact structure lacking H-bonds (2) Two-state models in which molecules at the junctions of 3-dimensional H-bond networks correspond to one state while molecules occupying framework voids correspond to the other. The ability of these models to account for various experimental phenomena is discussed. (Casey-Arizona)
W70-08528

1B. Aqueous Solutions and Suspensions

COLLIGATIVE PROPERTIES OF ANOMALOUS WATER,
Bristol Univ. (England). Dept. of Physical Chemistry.
D. H. Everett, J. M. Hayes, and P. J. McElroy.
Nature, Vol 226, No 5250, p 1033-1037, June 13, 1970. 5 p, 4 fig, 17 ref.

Descriptors: *Water structure, *Water properties, *Gels, *Silica, Colloids, Viscosity, Thermodynamics, Aqueous solutions, Physical properties, Vapor pressure, Water chemistry.
Identifiers: *Anomalous water, Polywater.

Investigations of the phase behavior on freezing and subsequent melting and of other properties indicate that anomalous water is a solution containing a fixed amount of relatively involatile material in normal water. There seems to be no need to postulate the existence of a new polymer of water in such solutions. If only water and silica are present, the properties are consistent with those of a silicic acid gel. (Knapp-USGS)
W70-08189

SALTING COEFFICIENTS FROM SCALED PARTICLE THEORY,
Connecticut Univ., Storrs. Dept. of Chemistry.
W. L. Masterton, and Tei Pei Lee.
Journal of Physical Chemistry, Vol 74, No 8, p 1776-1782, April 16, 1970. 7 p, 13 ref. OWRR Project H-013-CONN.

Descriptors: *Water chemistry, *Aqueous solutions, *Electrolytes, *Water properties, Solvent extractions, Ions, Saline water systems, Solubility, Desalination, Thermodynamics.
Identifiers: Salting coefficients.

Scaled particle theory is used to derive a general expression for the salting coefficient, ks, which appears in the Setschenow equation. This expression is essentially a sum of two terms, one of which will ordinarily be positive (salting out), while the other will be negative (salting in). Calculated values of ks are in excellent agreement with experiment for systems in which the molecular and ionic diameters are relatively small. For large molecules, the agreement is poorer, as is true with classical theories of the salt effect. The magnitude of ks is very sensitive to uncertainties in the diameters of anions and cations. (Knapp-USGS)
W70-08191

GENERAL PROBLEMS IN THE THEORY OF IONIC HYDRATION IN AQUEOUS SOLUTIONS,
Akademiya Nauk SSSR, Moscow. Institut Obshchei i Neorganicheskoi Khimii.
O. Ya. Samoilov.
Translated from Russian. In: Water in Biological Systems Consultants Bureau, New York, 1969, p 20-27. 6 fig, 1 tab, 29 ref.

Descriptors: *Aqueous solutions, *Hydrogen bonding, *Solubility, *Thermodynamic behavior, *Ionization, Sodium, Potassium, Dispersion, Solutions, Solvation.
Identifiers: *Ionic hydration.

An aqueous electrolyte solution is a heterodynamic system involving 3 types of interaction: (1) Ionic interactions which are long-range forces (2) Water molecule-ionic interactions (primarily ion-dipole) that weaken more rapidly with distance (3) Interactions between water molecules, with the formation of H-bonds which are short-range forces. The state of an ion in solution is governed not by the total interaction energies but principally by changes in energy over short distances. Positively hydrated ions such as Mg, Li, and Na ions strengthen the bonds between water molecules and their nearest neighbors, while K, Cs, and Cl ions are negatively hydrated with opposite effects. Experimental evidence for these phenomena is discussed. Negative hydration occurs only in those cases where solvent molecule interactions are sufficiently strong, and is displaced by positive hydration in aqueous solutions when temperature rises. This is due to rupture of H-bonds, decreasing solvent molecule interactions. Results of studies of the solubility of NaCl in methanol solutions with ethanol added, and in ethanol solutions with methanol added, accorded with the view that increases in structural stabilization of a solvent leads to decreases in solute solvation. (Casey-Arizona)
W70-08518

STRUCTURE OF WATER IN CRYSTALLINE HYDRATES OF CERTAIN BIOLOGICALLY IMPORTANT COMPOUNDS,
Akademiya Nauk SSSR, Moscow. Institut Obshchei i Neorganicheskoi Khimii.
G. G. Malenkov.
In: Water In Biological Systems Consultants Bureau, New York, p 28-37, 1969. 10 fig, 1 tab, 26 ref.

Descriptors: *Hydrates, *Hydrate processes, *Crystals, *Hydrogen bonding, *Water of hydration, Organic compounds, Organophosphorus compounds, Amino acids, Peptides, Biochemistry, Physicochemical properties, Cations, Anions.
Identifiers: *Copacking, *Law of densest packing, *Biopolymeric compounds, *Organic crystals, *Intermolecular interations, Nucleosides, Hydrophilic groups, Packing factor, Identity period, Electrostatic forces, Space filling.

Water is incorporated into simple and supermolecular biopolymeric compounds and serves both functional and structural roles. Determination of its precise localization is difficult, but it is known to obey the principle of densest packing in organic crystals. Crystals containing H have a tendency to form a maximum number of H-bonds, which only rarely conflicts with densest packing. When water is incorporated into organic crystals, copacking of the very small water molecules and the larger molecules occurs, leading to space filling and the most favorable conditions for H-bonding. The number, state, and distribution of the water molecules are determined by many characteristics of the main compound molecules such as shape and location of hydrophilic groups. The structures of the hydrates of several low molecular weight biopolymers are described, particularly with reference to their H-bonding. Structures containing chains of water molecules must be arranged to conform with the physicochemical requirement for water of 4.5 angstrom unit identity periods along the chain. Examples of this are described for some linear and cyclic molecules. Compounds are also described in which electrostatic forces play a role in addition to H-bonds and intermolecular forces. Finally, the crucial importance of water in organic phosphates and hydrophosphates is considered. (Casey-Arizona)
W70-08527

02. WATER CYCLE

2A. General

STUDY OF WATERSHED HYDROLOGY BY THE WATERSHED EXPERIMENTATION SYSTEM,
Illinois Univ., Urbana. Dept. of Hydraulic Engineering.
Ven Te Chow.
Nature and Resources, Bulletin of the International Hydrological Decade, Vol 6, No 1, p 12-14, March 1970. 3 p.

Descriptors: *Watersheds (Basins), *Hydrology, *Laboratory tests, *Model studies, Hydraulic models, Computer models, International Hydrological Decade, Simulated rainfall, Hydrogeology, Rainfall-runoff relationships, Streamflow, Forecasting, Simulation analysis.
Identifiers: Illinois University, Hybrid hydraulic-computer models.

The Watershed Experimentation System (WES) developed in the Hydraulic Engineering Laboratory of the Department of Civil Engineering, University of Illinois, integrates electronic, hydraulic, pneumatic, and structural components. For research on hydraulic and hydrologic problems in engineering, the WES can generate an artificial storm of given temporal and spatial distributions of rainfall intensities and move it in any desired direction over an area of 40 x 40 ft or less in the laboratory. Within this area, a testing drainage basin can be built and its hydraulic and hydrologic parameters, including size, shape, slope, surface roughness, stream pattern and storage capacity can be represented and altered. The runoff from the basin is automatically measured by sonars and instantaneously transmitted to an electronic computer for processing and printing-out of the hydrograph. (Woodard-USGS)
W70-08182

A CONCEPTUAL MODEL OF THE GROUNDWATER REGIME AND THE HYDROGEOLOGIC ENVIRONMENT,
Research Council of Alberta, Edmonton.
J. Toth.
Journal of Hydrology, Vol 10, No 2, p 164-176, February 1970. 13 p, 1 fig, 9 ref.

Descriptors: *Hydrogeology, *Model studies, *Equations, *Mathematical models, Aquifers, Groundwater movement Hydrologic budget, Regime, Mathematical studies, Discharge (Water), Climates, Geology, Water chemistry.
Identifiers: Hydrogeologic environment, Groundwater regime.

A conceptual model for the description, explanation, prediction, and control of hydrogeologic conditions is composed of two systems of physical and chemical parameters: the Hydrogeologic Environment, and the Groundwater Regime. The three components of the environment, each comprising a great number of parameters, are topography, geology, and climate. The necessary and sufficient parameters of the groundwater regime are: (1) amount of water, (2) geometric distribution of water movement, (3) volume or velocity of the flow, (4) chemical composition, (5) temperature, and (6) regime variance. The environment and regime are related quantitatively and each regime parameter can be expressed mathematically as a function of the environmental components. This allows the evaluation of the groundwater regime if the environmental conditions are known, as well as inferences concerning the aquifer from known properties of the regime. To date few parameters have been evaluated exactly, and mostly conceptual equations are presented. (Knapp-USGS)
W70-08208

RIVER FLOW FORECASTING THROUGH CONCEPTUAL MODELS - PART I - A DISCUSSION OF PRINCIPLES,
University Coll., Galway (Ireland). Dept. of Engineering.
For primary bibliographic entry see Field 02E.
W70-08211

PRECIPITATION, STREAMFLOW, AND MAJOR FLOODS AT SELECTED SITES IN THE GILA RIVER DRAINAGE BASIN ABOVE COOLIDGE DAM, ARIZONA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W70-08468

GROUNDWATER - SURFACE WATER RELATION DURING PERIODS OF OVERLAND FLOW,
Geological Survey, Indianapolis, Ind.
James F. Daniel, Louis W. Cable, and Ronald J. Wolf.
For sale by the Superintendent of Documents US Government Printing Office, Washington, DC 20402 - Price $3.25. In: Geological Survey Reasearch 1970, Chapter B, US Geological Survey Professional Paper 700-B, p B219-B223, 1970. 5 p, 8 fig, 3 ref.

Descriptors: Surface-groundwater relationships, *Flood plains, *Bank storage, *Floods, *Overland flow, Base flow, Hydrograph analysis, Hydrographs, Aquifers, Alluvial channels, Indiana.
Identifiers: White River (Ind).

The groundwater exchange mechanism at the stream interface during periods of overland runoff was investigated by means of observation wells installed in the flood plain on the White River near Noblesville, Ind. Groundwater discharge decreases with the beginning of a stream rise, ceases after a short time interval, and then bank storage begins. A volume of discharge from the aquifer equal to that which entered as bank storage at the study site was dissipated 54 hours after an overbank peak, 42 hours after a medium peak and 50 hours after a small peak. The results were used to formulate a theoretical method for stream-hydrograph separation of base flow and overland flow. The separation method shows no groundwater runoff until bank storage and channel storage volumes have been dissipated. All discharge in the stream before and after this period is equal to that contributed by the aquifer system. (Knapp-USGS)
W70-08488

TRENDS IN RUNOFF,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02B.
W70-08491

THE RELATIONSHIP BETWEEN SURFACE WATER AND GROUNDWATER IN SHIP CREEK NEAR ANCHORAGE, ALASKA,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 02F.
W70-08492

2B. Precipitation

SPACE VARIATIONS OF PRECIPITATIONS FOR RAINAGE NETWORK DESIGN,
Agricultural Research Service, Danville, Vt. Soil and Water Conservation Research Div.
Robert L. Hendrick, and George H. Comer.
Journal of Hydrology, Vol 10, No 2, p 151-163, February 1970. 13 p, 11 fig, 1 tab, 5 ref.

Descriptors: *Distribution patterns, *Rainfall, *Network design, *Rain gages, Rainfall disposition, Correlation analysis, Demonstration watersheds, Topography, Statistical methods, Vermont.
Identifiers: Sleepers River Watershed (Vt).

Space variations of daily precipitation are amined in terms of the field of inter-station cor tions over the Sleepers River Watershe northern Vermont. The correlation field abo control gage is dependent on inter-station dist and azimuth, daily rainfall amount, and the se of the year. No dependence on elevation or el tion difference (slope) was found. A correla field function is derived which is then used to d mine raingage density and configuration requ for specified accuracy of watershed precipita estimates. (Knapp-USGS)
W70-08178

CLIMATIC ESTIMATES OF AVERAGE PROBABLE IRRIGATION REQUIREME AND OF SEASONAL DRAINAGE IN CANAD
Department of Agriculture, Ottawa (Onta Plant Research Inst.
For primary bibliographic entry see Field 03F.
W70-08216

PROBABLE MAXIMUM PRECIPITATION F THE LOWER RIO GRANDE,
Weather Bureau, Silver Spring, Md. Office Hydrology.
John T. Riedel.
Water Resources Bulletin, Vol 6, No 3, p 439-4 May-June 1970. 13 p, 8 fig, 6 tab, 5 ref.

Descriptors: *Probable maximum precipitati *Rio Grande, *Hurricanes, *Flood forecast Precipitation (Atmospheric), Rainfall, Depth-ar duration analysis, Planning, Flood protection, ternational Boundary and Water Commissi Mexico, United States.
Identifiers: Lower Rio Grande Valley.

To aid in planning and design of additional fl protection on the Lower Rio Grande, Hydrometeorological Branch prepared a proba maximum precipitation study for the Internatio Boundary and Water Commission (United Sta and Mexico) and the Republic of Mexico. F drainages from 2,000 to over 17,000 square m in area between Falcon and Anzalduas Dams cluding Rio San Juan and Rio Alamo in Mexico the areas of concern. The great rains of hurric Beulah, September 19-24, 1967 verified that ad tional protection is needed. Procedures for estim ing probable maximum precipitation (PMP) described. A particular problem was to estim rainfall potential for the Sierra Madre Orientali Rio San Juan and Alamo drainages. These mo tains form a north-south windward-facing slope a barrier of over 7,000 feet in elevation. A detail study was made of rains from hurricane Beul The storm produced the greatest known r depths in North America for 50,000 square mi or greater, and durations longer than 48 hours. napp-USGS)
W70-08229

SNOW HYDROLOGY IN THE FOREST E VIRONMENT,
British Columbia Univ., Vancouver. Dept. Forestry.
For primary bibliographic entry see Field 02C.
W70-08240

DUSTINESS OF AIR DURING DUST STORM ON THE MANGYSHLAK PENINSULA (IN RU SIAN),
S. S. Kharitonova.
Meteorologiya i Gidrologiya, No 5, p 87-88, 196 2 p, 4 ref.

Descriptors: *Dust storms, *Air pollution, Wi velocity, Particle size, Wind erosion, Soil erosio Air environment, Humidity, Air temperature, Se ment transport, Winds.
Identifiers: *Air quality measurements, Dust f USSR, Mangyshlak Peninsula.

Data are presented from observations of 220 d storms studied during 1964-68 on the Mangysh

ninsula, USSR. The storms lasted from several inutes to 18 hours each. Air samples for analysis ere collected at heights of 3,10, and 20 m above e ground, and measurements of atmospheric tem- rature, humidity, and wind conditions were corded at the same time. Results showed that st storms are of local character, originating at nd speeds higher than 6-7 m/sec and indepen- nt of wind direction. Dust particles of 0.01 - 0.25 icron predominated. The highest dust concentra- on in a storm was 245 mg/cu m at 3 m above the ound. Highest average dustiness occurred in mmer (40 mg/cu m). The most rapid decrease of st in the air was observed at heights between 3-) m. (Lang-USGS)
70-08275

ROBABLE MAXIMUM PRECIPITATION VER SOUTH PLATTE RIVER, COLORADO, ND MINNESOTA RIVER, MINNESOTA,
Veather Bureau, Washington, D.C. Office of ydrology.
ohn T. Riedel, Francis K. Schwarz, and Robert L. Veaver.
eport available for sale by Superintendent of ocuments, US Government Printing Office, Vashington, DC 20402 - Price $1.25. US Weather ureau Hydrometeorological Report No 44, Janua- 1969. 114 p, 59 fig, 23 tab, 25 ref.

escriptors: *Probable maximum precipitation, Flood forecasting, *Mississippi River, *Colorado, Minnesota, Weather forecasting, Snowmelt, Dis- ribution patterns, Meteorology, Synoptic analysis, Maximum probable flood, Weather data, Depth- rea-duration analysis, Flood control, Planning.
dentifiers: *South Platte River (Colo), Minnesota iver.

The great rain and snowmelt floods on the Upper Mississippi and its tributaries in April were among he most disastrous ever experienced in these areas. For example, at Carver on the Minnesota River the previous high stage of 1952 was exceeded by 6 feet. Another flood resulted in great damage along the South Platte River in and near Denver from ex- remely heavy thunderstorm-type rainfall of about 6 hours duration centered on upstream tributaries o the south of Denver. Both floods were occa- ioned by intense examples of common meteorological processes in the respective regions nd seasons -- snowmelt over a broad area in spring over the Upper Mississippi and intense short-dura- ion storms to the immediate east of the Rockies during the May-June maximum storm period of hat area. The Hydrometeorological Branch of the Weather Bureau prepared probable maximum precipitation estimates for these basins above prospective dam sites in order to revise and update spillway design floods. The basic method for esti- mating PMP is the transposition and moisture max- imization of storms. The two reports to the Corps of Engineers have been incorporated into one volume in order to illustrate a variety of methods of estimating probable maximum precipitation. (K- napp-USGS)
W70-08277

FRESHWATER ECOLOGY IN THE MATO GROSSO, CENTRAL BRAZIL I. THE CONDUC- TIVITY OF SOME NATURAL WATERS,
Westfield Coll, London (England). Dept. of Zoolo- gy.
For primary bibliographic entry see Field 02E.
W70-08346

TRENDS IN RUNOFF,
Geological Survey, Washington, D.C.
P. H. Carrigan, Jr., and E. D. Cobb.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402 - Price $3.25. In: Geological Survey Research 1970, Chapter B, US Geological Survey Professional Paper 700-B, p B214-B218, 1970. 5 p, 4 tab, 29 ref.

Descriptors: *Precipitation (Atmospheric), *Cli- mates, *Weather data, Forecasting, River forecast- ing, Climatology.
Identifiers: *Climatic trends.

Trend analysis of long-term precipitation records suggests that runoff is free of trend since at least 1830 over most of the world. The findings, reviewed in this report, of other investigators of hydrologic trends indicate that trends in runoff throughout much of the world seem to be nonex- istent since the early part of the last century. (K- napp-USGS)
W70-08491

CLIMATE, SURVIVAL AND THE SECOND-CLASS SOCIETIES IN PALESTINE BEFORE 3000 B. C.,
Balliol Coll., Oxford (England).
For primary bibliographic entry see Field 06G.
W70-08538

2C. Snow, Ice, and Frost

SNOW HYDROLOGY IN THE FOREST EN- VIRONMENT,
British Columbia Univ., Vancouver. Dept. of Forestry.
W. W. Jeffrey.
In: Snow Hydrology, Proceedings of Workshop Seminar at New Brunswick University, Frederic- tion, February 28-29, 1969; Published by Secretariat, Canadian National Committee for the International Hydrological Decade, Ottawa, p 1- 19, 1970. 19 p, 9 fig, 7 tab, 59 ref.

Descriptors: *Snow management, *Forest manage- ment, *Water yield improvement, Snowpacks, Soil- water-plant relationships, Water conservation, In- terception, Albedo, Water balance, Solar radiation, Evapotranspiration, Snowfall, Snowmelt, Runoff, Watershed management.
Identifiers: Snow hydrology, Canada.

The forest ecosystem differs from other vegetated sites primarily in its protusion of a large intercept- ing and radiating biomass above the snowpack sur- face and into the atmosphere. This protruding biomass is of highly complex and extremely varia- ble three-dimensional geometry. The biomass, ex- tending into the atmosphere for as much as 200 feet or more above the soil surface, affects wind movement and turbulent flux of sensible heat; it ab- sorbs shortwave radiation and emits longwave; it modifies air temperature; it intercepts precipitation as rain, snow or fog; it transpires freely during the growing season, and perhaps to some extent over winter; it affects soil temperature, soil freezing and soil porosity; it influences the drainage pattern of cold air in sloping terrain. Most of the particular characteristics of the forest environment may be ascribed to the influence of this aerial biomass. Management of snow zone forests has potentialities for both desirable effects, as in larger flood peaks. (Knapp-USGS)
W70-08240

SNOW HYDROLOGY OF THE PRAIRIE EN- VIRONMENT,
Saskatchewan Univ., Saskatoon. Div. of Hydrolo- gy.
D. M. Gray.
In: Snow Hydrology, Proceedings of Workshop Seminar at New Brunswick University, Frederic- tion, February 28-29, 1969: Published by Secretariat, Canadian National Committee for the International Hydrological Decade, Ottawa, p 21- 33, 1970. 13 p, 7 fig, 4 tab, 10 ref.

Descriptors: *Snowpacks, *Grasslands, Snowfall, Snowmelt, Water balance, Water yield, Climatolo- gy, Snow surveys, Albedo, Solar radiation, Snow management.
Identifiers: Snow hydrology, Canada, Prairies.

Heat-budget or Energy-Budget equations are used to study the disposition of Prairie snowpacks. Unique features of the Prairie environment which affect the magnitudes of the heat components of the equation as compared to their evaluation in other regions of the country are discussed. On the Prairies, snow represents a main and vital source of the manageable fresh water supply. In these semi- arid regions, about 80-85% of the streamflow in the major river systems and the water stored in prairie dugouts and sloughs comes from the shallow snow- pack. With the normal climatic conditions which prevail on the Prairies during the winter months, the net energy exchange is negative (outward) resulting in a lowering of the snowpack tempera- ture below freezing (32 deg F), the amount of evaporation from the pack is negligible, and the net convective heat transfer to or from the pack is negligible. The relative importance of these com- ponents to the exchange changes at the time of melt or under Chinook conditions. (Knapp-USGS)
W70-08241

PROBLEMS OF MEASURING AND EVALUAT- ING SNOWCOVER,
Canada Department of Transport, Toronto (On- tario). Meteorological Branch.
G. A. McKay.
In: Snow Hydrology, Proceedings of Workshop Seminar at New Brunswick University, Frederic- tion, February 28-29, 1969: Published by Secretariat, Canadian National Committee for the International Hydrological Decade, Ottawa, p 49- 65, 1970. 17 p, 9 fig, 5 tab, 10 ref.

Descriptors: *Snow surveys, *Snowpacks, *Water equivalent, Snowmelt, Water yield, Snowfall, Precipitation (Atmospheric), Synoptic analysis, Winds, Vegetation effects, Energy budget, Water balance, Measurement.
Identifiers: Snow hydrology, Canada.

Snowcover measurements are required generally to determine the water equivalent or an index of the water equivalent over an area. Measurements of the structure of the cover are also necessary for the study of snow melt, trafficability and other proper- ties. The water equivalent of snowcover and the character of the snow cover at a point can be mea- sured with reasonable precision; however, there are difficulties in obtaining precise measurements of the water equivalent of the snow cover over an area. These difficulties arise from the heteroge- neous nature of snowcover, and the limitations of in- struments and measuring techniques. The heterogeneous character of the snowcover and the climatic controls which shape the pack are discussed to indicate the nature of the measure- ment problem. Only brief reference is made to measurements and instruments. (Knapp-USGS)
W70-08242

SNOW ACCUMULATION RELATED TO ELEVATION, ASPECT AND FOREST CANOPY,
Colorado State Univ., Fort Collins. Dept. of Watershed Resources.
J. R. Meiman.
In: Snow Hydrology, Proceedings of Workshop Seminar at New Brunswick University, Frederic- ton, February 28-29, 1969: Published by Secretariat, Canadian National Committee for the International Hydrological Decade, Ottawa, p 35- 47, 1970. 13 p, 3 tab, 70 ref.

Descriptors: *Snowpacks, *Snow cover, Altitude, Forests, Vegetation effects, Elevation, Topog- raphy, Weather, Climates, Water yield, Water balance.
Identifiers: Snow hydrology.

North American studies on the relative magnitude of the effects of elevation, aspect, and the forest canopy on snow accumulation within the boundary conditions of atmospheric factors and major physiography of specific sites are reviewed. There are strong indications that accumulation, irrespec- tive of melt, is related to aspect. This is generally

reflected in regionalization of accumulation areas but such effects may exist on a very localized basis as well. Generally the differences resulting from canopy influences tend to be smaller than those associated with elevational changes. The effects of elevation, aspect, and forest canopy on maximum snowpack water equivalent exhibit tremendous variability between and within given physiographic-climatic boundary conditions. (Knapp-USGS)
W70-08243

THE SYNTHESIS OF SNOWMELT HYDROGRAPHS,
Maine Univ., Orono. Water Resources Research Center.
W. Viessman, Jr.
In: Snow Hydrology, Proceedings of Workshop Seminar at New Brunswick University, Fredericton, February 28-29, 1969: Published by Secretariat, Canadian National Committee for the International Hydrological Decade, Ottawa, p 67-75, 1970. 9 p, 7 fig, 7 ref.

Descriptors: *Snowmelt, *Hydrographs, *Synthetic hydrology, *Hydrograph analysis, *Routing, Streamflow forecasting, Water yield, Water equivalent, Unit hydrographs, Time lag, Water storage.
Identifiers: Snow hydrology.

The synthesis of snowmelt or rainfall-snowmelt hydrographs is discussed. It is likely that such hydrographs are more difficult to adequately generate than those produced by other antecedent conditions. Not only must the usual basin parameters and losses be considered, but in addition the snowmelt process becomes exceedingly important. It is also necessary to consider periods of continued rainfall and snowmelt. Another complicating factor is that the usual system of categorizing losses is not generally applicable. Rain-on-snow or snowmelt-only hydrographs are usually synthesized through the use of unit hydrographs or storage routing techniques. In either case the effective input must be determined. This requires a fundamental knowledge of the drainage basin and snowpack characteristics. The computed outflow cannot be expected to be any more reliable than the finally estimated input. Hydrographs might be synthesized by considering the basic differential equations governing fluid flow. As research continues and computer capacity increases, such an approach will likely become a practical working tool. (Knapp-USGS)
W70-08244

CONDITONS UNDER WHICH SOLAR RADIATION PENETRATES INTO ICE,
S. A. Shishokin.
Transl from Transactions of the Kazakh Hydrometeorological Scientific Research Institute (Trudy KazNIGMI), No 32, p 129-138, 1969. Soviet Hydrology: Selected Papers, Issue No 1, p 98-106, 1969. 9 p, 5 fig, 4 tab, 7 ref.

Descriptors: *Solar radiation, *Ice, *Albedo, Cryology, Heat balance, Melting, Instrumentation, Measurement.
Identifiers: Ice transparency, USSR.

Penetration of solar radiation into ice depends on solar height, the type of radiation, the structure of the ice, its thickness, and its degree of decay. Actinometric observations were made on the radiation regime of the ice cover on the Ili River, USSR, in the spring of 1963 and in the upper pool of the Krasnoyarsk hydroelectric power station in 1964. Global radiation and the radiation reflected from the surface of the sample were determined at the beginning and end of a series of measurements of radiation intensity in the ice. To exclude the influence of reflection from the surfaces surrounding the ice, an albedometer was installed at a height of 10-15 cm. In the absence of local impurities, the intensity of radiation reflected from the ice is the same. Most intense light attenuation occurs in a relatively thin surface layer for all types of ice. The thickness of this layer is less than 5-6 cm for water and slush ice. It is approximately 25 cm for snow-slush ice and corresponds to the lower boundary of the snow ice layer. In the layer of intense light attenuation, the amount of penetrating radiation decreases by a factor of 2.2 in monocrystalline ice, a factor of about 3.5 in slush ice, and a factor of 7-8 in snow ice. Below this layer, radiation intensity decreases relatively slowly, nearly linearly. (Knapp-USGS)
W70-08255

PROBABILITY CHARACTERISTICS OF THE FREEZE-UP AND BREAKUP DATES OF RIVERS,
B. M. Ginzburg.
Transl from Trudy Gidromet. Tsentra, No 40, p 21-39, 1969. Soviet Hydrology: Selected Papers, Issue No 1, p 64-78, 1969. 15 p, 4 fig, 9 tab, 26 ref.

Descriptors: *Ice breakup, *Freezing, *Rivers, *Navigation, *Forecasting, Statistical methods, Probability, Ice jams, Data collections, Hydrologic data.
Identifiers: USSR.

The statistical methods used to predict ice breakup and freezing of rivers in the USSR are outlined. The length of the observational records for the major navigable rivers of the European USSR is at least 60 years in most cases. The records for Siberian rivers were shorter, but for the waterways, except in the Arctic, they were at least 40 years and in West Siberia and for the Amur, 50 years. Nearly all stations on the rivers of the European USSR with records of less than 40 years, and on rivers in the Asiatic USSR with records of less than 30 years, are located on small, intermittently navigable rivers. Thus, fairly limited samples served as initial material for the construction of integral probability curves. The accuracy in the determination of dates of different integral probability is characterized by a probable error close to observation accuracy and a limiting error at a 5 per cent significance level close to the corresponding error in the computation of the average date. (Knapp-USGS)
W70-08267

SNOW STORAGE DISTRIBUTION IN RIVER BASINS,
V. V. Rakmanov.
Transl from Trudy Gidromet. Tsentra, No 37, p 52-69, 1969. Soviet Hydrology: Selected Papers, Issue No 1, p 49-63, 1969. 15 p, 5 fig, 7 tab, 8 ref.

Descriptors: *Snow cover, *Snowpacks, *Water yield, *Water storage, *Probability, Statistical methods, Distribution patterns, Snow surveys, Runoff forecasting.
Identifiers: *USSR, Snow cover distribution.

Methods of computing the total snow storage distribution in river basins are described. They can be used in any region if the network of snow survey points is adequate and permits determination of the basin distribution of storage and if it is possible to select appropriate typical local distribution curves. The use of typical curves to describe snow storage distribution is entirely justified only for relatively small basins or those areas of larger basins where the average snow storage at separate points differs little from the total average value in the basin. For a large basin, snow storage distribution depends not only on its variation over each given area, but also on the variation in average snow storage in areas of the basin relative to their total average value in the basin. (Knapp-USGS)
W70-08268

HEAT TRANSFER COEFFICIENT IN WATER BODIES WITH LIMITED FLOWAGE DURING SUMMER HEATING,
K. I. Rossinskiy, and M. P. Kravtsova.
Transl from Trudy Gos. Gidrol. Inst-ta, No 162, p 205-220, 1969. Soviet Hydrology: Selected Papers, Issue No 1, p 27-38, 1969. 12 p, 5 fig, 2 tab, 9 ref.

Descriptors: *Heat transfer, *Lakes, *Turbule
*Cold regions, Convection, Conduction, Heat t
Mass transfer, Temperature, Mixing, Solar r
tion.
Identifiers: USSR, Great Bear Lake (Canada).

In small bodies of water with active through-c
lation, the basic heat transfer agent throughou
year is turbulent water flow. In deep water bo
with limited flowage, heat transfer occurs du
different seasons and in different parts of the w
bodies under the influence of different factors
the onset of summer heating, until the surface l
temperature reaches 8 deg C, the transfer of
occurs through the joint effect of convective
intensive mixing of waters due to the turbule
producing effect of the wind. During the pe
from the spring breakup to spring isothermy,
transfer occurs under the influence of free con
tion and mixing induced by the wind. During
period of isothermy, the main heat tran
processes are played by free convection. Obse
tions made during the summers of 1964 and 1
in Great Bear Lake (Canada) revealed that con
tive currents usually occupy considerable w
depths, as deep as 225 m, whereas during
years, when there is lesser heating, they extend
the very bottom, as deep as 450 m. (Knapp-USG
W70-08269

**WATER PERMEABILITY OF FROZEN SO
IN THE CENTRAL CHERNOZEM PROVINC**
For primary bibliographic entry see Field 02G.
W70-08272

**WORKSHOP ON SNOW AND ICE HYDROD
GY.**

Proceedings of the Workshop on Snow and I
Hydrology, Colorado State University, Fort C
lins, August 18-22, 1969; published by US Natio
Committee for International Hydrological Deca
1969. 142 p.

Descriptors: *Water resources developme
*Snow management, *Hydrology, *Conferenc
*International Hydrological Decade, Avalanch
Glaciers, Snowpacks, Snowfall, Streamfl
forecasting, Runoff forecasting, Melting, Ablati
Regimen, Snow surveys, Remote sensing, Resea
and development.
Identifiers: Snow hydrology.

The primary objective of the Workshop was to i
prove communications among those from vario
professional backgrounds and geographical regio
having a common interest in snow and ice. T
state of the art of snow and ice hydrology was
plored and an attempt was made to identify a
define some of the major problems and possi
solutions. Emphasis was placed on hydrologic re
tions of the seasonal snow cover. Much of t
discussion was pertinent to both seasonal sno
cover and perennial snow and ice. (Knapp-USGS
W70-08276

**NEARSHORE UNDER ICE WATER MOV
MENT AT NANTICOKE, LAKE ERIE - 1970,**
Ontario Water Resources Commission, Toron
Great Lakes Water Quality Surveys Program.
For primary bibliographic entry see Field 02H.
W70-08479

2D. Evaporation and Transpiratio

**WATER BALANCE OF SOME WARM DESE
PLANTS IN A WET YEAR,**
Nevada Univ., Reno. Desert Research Inst.
N. Stark.
Journal of Hydrology, Vol 10, No 2, p 113-12
February 1970. 14 p, 5 fig, 1 tab, 7 ref. NSF Gra
No GB 6681.

Descriptors: *Soil-water-plant relationshi
*Deserts, *Water balance, *Water loss, *Wa

torage, Arid lands, Arid climates, Water supply, Rainfall, Precipitation (Atmospheric), Soil water movement, Recharge, Infiltration, Evaporation, Transpiration, Evapotranspiration, Air temperature, Humidity.
Identifiers: Death Valley (Calif).

Studies of the water balance on a hectare of gravelly wash in northern Death Valley showed that in an exceptionally wet year, the plants can obtain moisture from free soil water and the condensation of soil water vapor in March. In May, with higher soil temperature extremes, distillation and condensation in the 20 to 40 cm soil zone provided more than enough water to make up for the water loss from evapotranspiration. By June, the rate of water loss and other physiological processes were greatly decreased. Distillation and condensation in June did adequately supply transpiration water loss during a cloudy, cool period. Transpiration of the four dominant species based on grams of water lost per gram of dry weight varied from March through June by species. Internal water stress correlated closely with transpiration rates. Diurnal increase in internal moisture stress generally followed the decrease in the transpiration rate in June. From March 10 through June 10, input was 2.6 g/sq cm, evapotranspiration was 4.0 g/sq cm, and soil moisture loss was 1.0 g/sq cm. The difference between soil moisture loss and evapotranspiration losses was 0.4 g/sq cm which is the result of measuring soil moisture outside of the root zone instead of within the root zone. (Knapp-USGS)
W70-08175

SOME ISOPLETH MAPS BASED ON LYSIMETER OBSERVATIONS IN THE BRITISH ISLES IN 1965, 1966, AND 1967,
Nature Conservancy, Huntingdon (England).
F. H. W. Green.
Journal of Hydrology, Vol 10, No 2, p 127-140, February 1970. 14 p, 3 fig, 7 ref.

Descriptors: *Evapotranspiration, *Evaporation, *Mapping, *Contours, Hydrologic budget, Water balance, Surveys, Synoptic analysis, Lysimeters, Networks, Instrumentation.
Identifiers: *British Isles, *Isopleths, Potential evaporation.

A small network of standardized observations of Potential Evaporation is in operation in the United Kingdom and the Republic of Ireland. Tentative isopleth maps, based on these observations, are presented, and discussed, for the years 1965, 1966, and 1967, together with maps of Potential Water Deficit. Some comparison is made with maps from other sources. (Knapp-USGS)
W70-08176

HYDROGEN ISOTOPIC FRACTIONATION OF WATER PASSING THROUGH TREES,
Geological Survey, Denver, Colo.; and Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 02K.
W70-08186

EVAPOTRANSPIRATION MEASUREMENT BY CHLORIDE TRANSLOCATION,
Agricultural Research Service, Reno, Nev. Soil and Water Conservation Research Div.
A. S. Dylla, and D. M. Stuart.
Journal of Hydrology, Vol 10, No 2, p 185-192, Feb 1970. 8 p, 2 fig, 3 tab, 7 ref.

Descriptors: *Evapotranspiration, *Soil chemistry, *Root zone, *Mass transfer, *Soil water movement, Chlorides, Saline water systems, Leaching, Soil-water-plant relationships, Water chemistry, Solutes.
Identifiers: Chloride translocation.

Profiles in evapotranspiration tanks were sampled at the start and end of the 1968 growing season to determine chloride ion translocation into the top 90 cm of the soil by which seasonal evapotranspiration was estimated. Coefficients of variation between profile totals ranged from 0.11 to 0.21 for the profiles sampled in April and from 0.39 to 0.45 for profiles sampled in October. The lower variation in April is attributed to the pre-season leaching. The greatest increase in chlorides in the vegetated tanks occurred in the top 15 cm; however, there was significant increase in all sample increments down to 60 cm, which is about the depth of the meadow grass rooting. Variability of total chlorides in adjacent soil profiles of vegetated surfaces makes the method of determining seasonal or long-term evapotranspiration from chloride translocation only a rough estimate. To obtain valid mean chloride profiles from which good evapotranspiration estimates could be expected would require very extensive soil sampling and nonchanging groundwater quality below the root zone during the measuring interval or season. (Knapp-USGS)
W70-08210

SOIL MOISTURE TENSION TRANSIENTS ASSOCIATED WITH EVAPOTRANSPIRATION FROM A WATER TABLE,
Agricultural Research Service, Fresno, Calif. Field Station.
W. C. Bianchi, and Rhys Tovey.
Soil Science Society of America Proceedings, Vol 34, No 3, p 496-501, May-June 1970. 6 p, 9 fig, 2 tab, 9 ref.

Descriptors: *Lysimeters, *Moisture tension, *Evapotranspiration, *Unsaturated flow, *Root zone, Diffusivity, Capillary fringe, Water table, Tensiometers, Soil water movement, Water balance, Instrumentation, Irrigation, Strain gages.
Identifiers: Straingage tensiometers.

Soil moisture tensions were recorded continuously in lysimeters containing a loam soil and a controlled water table. Seven strain gauge-pressure transducer-tensiometers were spaced from 20 to 110 cm above the 158-cm water table. The velocity at which the morning and evening soil moisture tension minimum and maximum progressed downward through the root zone and capillary fringe proved inconsistent with soil moisture flow theory. This was interpreted as showing that even at low tensions a decrease in the moisture film continuity between the soil and tensiometer bulb relative to that between the few roots in contact with the bulb, caused the measurement to be biased toward the tensions associated with the root system. When the minimum daily tension exceeded 400 cm, soil-bulb continuity was lost and, as a result, the characteristic wave form of daily evaporation (ET) demand was also lost. By placing the tensiometers in the capillary fringe where roots are absent, they could record the changing demands of ET on the capillary fringe. A method was tested for estimating water table uptake from a diffusivity based on the velocity of propagation of tension waves induced into the soil profile by daily ET and associated diurnal gradient changes. (Knapp-USGS)
W70-08225

EVAPORATION AND CONDENSATION ON BARE SOIL UNDER IRRIGATION IN THE EAST CENTRAL GREAT PLAINS,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
Norman J. Rosenberg.
Agronomy Journal, Vol 61, No 4, p 557-561, July-August 1969. 3 tab, 27 ref. OWRR Project A-001-NEB.

Descriptors: *Evaporation, *Condensation, *Advection, *Irrigation effects, *Great Plains, Evapotranspiration, Dew, Rainfall, Environmental effects, Irrigation, Drying, Irrigated land, Semiarid climates, Nebraska, Heat transfer, Lysimeters.
Identifiers: *Net radiation, *Oasis effect, *Bare soil, *Potential evaporation, *Nocturnal evaporation.

Precision weighing lysimeters were used during the summer and fall of 1966 to measure evaporation from bare Sharpsburg sandy clay loam at Mead, Nebraska. Maximum daily evaporation was about 9 mm during August and about 3 mm during October. On days following a rain the evaporation from bare soil was in close agreement with available total net radiation, but on days following irrigation of only the lysimeters and buffer area the E/Rn was significantly greater than unity. This would indicate a strong oasis effect with a large advectional contribution of energy. From 10 to 50% of the total daily evaporation was nocturnal, the higher proportions occuring during the fall. Dew was detected on most mornings and the maximum deposition measured was about 0.5 mm. Both the Penman and van Bavel methods of estimating evaporation varied from lysimetrically measured evaporation by 3 to 50% on a daily basis, but the Penman method yielded lower estimates of bare soil evaporation. (Carr - Arizona)
W70-08352

OBJECTIVES, METHODS, AND ENVIRONMENT--GILA RIVER PHREATOPHYTE PROJECT, GRAHAM COUNTY, ARIZONA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 03B.
W70-08467

WINDS OVER SALTCEDAR,
Geological Survey, Lubbock, Tex.
T. E. A. Vay Hylckama.
Agricultural Meteorology, Vol 7, p 217-233, 1970. 17 p, 9 fig, 2 tab, 21 ref.

Descriptors: *Evapotranspiration, *Turbulence, *Wind velocity, *Tamarisk, Phreatophytes, Evapotranspiration control, Water yield improvement, Meteorology, Arizona, Consumptive use, Water loss.
Identifiers: Wind profiles.

An analysis of hourly wind speeds above and within a stand of saltcedar near Buckeye, Arizona, reveals that in 90% of all observed cases, the wind profiles above the stand can be represented by a simple logarithmic equation. The roughness length (disregarding zero displacement), varies with a stability ratio similar to Richardson's number. The friction velocity, depends on the wind speeds above the vegetation. Within the thickets there is considerable turbulence, and irregular wind inversions occur during daylight hours. The results are important for estimating water losses by evapotranspiration by either the energy-budget or the mass-transfer formulae. (Knapp-USGS)
W70-08469

ENERGY BALANCE ESTIMATES OF EVAPOTRANSPIRATION,
Oregon State Univ., Corvallis. Dept. of Forest Climatology.
Lloyd W. Gay.
In: Water Studies in Oregon; Oregon State University Water Resources Research Institute Fall Quarter 1969 Seminar WR012.69 Corvallis, p 17-39, January 1970. 23 p, 11 fig, 1 tab, 16 ref.

Descriptors: *Evapotranspiration, *Energy budget, *Microclimatology, Microenvironment, Soil-water-plant relationships, Water yield improvement, Forests, Wetlands, Deserts, Grasslands.
Identifiers: Pacific Northwest.

The role of vegetation in the evapotranspiration process is described to show the importance of this process in the establishment of a surface energy balance. Application of energy balance theory was demonstrated by the field experiments carried out over two contrasting sites, a pumice desert and a lush wet meadow in the Pacific northwest. Analysis to two similar days indicated that the wet meadow evaporated 5.1 mm (0.2 in) for the period 0730-1930 PDT; this was about six times the evaporation estimated over the pumice desert for the same

period. The lack of water available for vaporization at the pumice site caused major differences in the surface energy balances of the 2 sites. The resulting microclimate effects are quite important in the zone where plant growth would take place near the surface. (See also W70-08475). (Knapp-USGS)
W70-08477

EVAPORATION FROM LAKE TIBERIAS: AN ESTIMATE BY THE COMBINED WATER BALANCE-MASS TRANSFER APPROACH,
National and Univ. Inst. of Agriculture, Rehovoth (Israel). Volcani Inst. of Agriculture Research.
For primary bibliographic entry see Field 02H.
W70-08534

2E. Streamflow and Runoff

STUDY OF WATERSHED HYDROLOGY BY THE WATERSHED EXPERIMENTATION SYSTEM,
Illinois Univ., Urbana. Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 02A.
W70-08182

A NOTE ON THE RECOGNITION, CAUSE, AND POSSIBLE GEOLOGIC IMPORTANCE OF GROUNDWATER MICROFLOW SYSTEMS IN ALLUVIAL-CHANNEL BED-FORMS,
Wisconsin State Univ., Oshkosh. Dept. of Geology; and North Dakota Univ., Grand Forks. Dept. of Geology.
Samuel S. Harrison, and Lee Clayton.
North Dakota Academy of Science Proceedings, Vol 22, p 9396, 1968. 4 p, 2 fig, 1 ref.

Descriptors: *Sedimentary structures, *Surface-groundwater relationships, *Dunes, *Ripple marks, Channel morphology, Alluvial channels, Alluvium, Groundwater movement, Seepage.
Identifiers: Groundwater microflow systems.

Groundwater microflow systems in natural bed-forms were noted during experiments on sediment transport in laboratory flumes. Ripple bed-forms consisting of medium sand injected with dye showed incipient movement of the dye through the sand after an elapsed time of 5 minutes. Dye movement was greatest beneath the gently sloping upstream side of the bed-forms. Water from the stream channel enters the upstream side of the bed-forms, flows in a concave-upward arc downstream, and emerges at the crest of the bed-forms. Water which enters the stream bed less than roughly 1/2 wavelength in front of the bed-form crest flows in an arc upstream and emerges at the nearest crest. The microflow is caused by pressure variations from the hydrostatic on the surface of the bed-forms. The pressure on the bed-form surface is greatest in the low areas above the crests. (Knapp-USGS)
W70-08207

RIVER FLOW FORECASTING THROUGH CONCEPTUAL MODELS - PART I - A DISCUSSION OF PRINCIPLES,
University Coll., Galway (Ireland). Dept. of Engineering.
J. E. Nash, and J. V. Sutcliffe.
Journal of Hydrology, Vol 10, No 3, p 282-290, Apr 1970. 9 p, 2 fig, 3 ref.

Descriptors: *Model studies, *Streamflow forecasting, *River forecasting, *Mathematical models, *Statistical models, Rainfall-runoff relationships, Flood forecasting, Parametric hydrology, Optimization, Systems analysis, Regression analysis.
Identifiers: Model fitting.

The principles governing the application of the conceptual model technique to river flow forecasting are discussed. The necessity for a systematic approach to the development and testing of the model is explained and some preliminary ideas suggested. (Knapp-USGS)
W70-08211

DERIVATION OF FORMULAE FOR VARIABLE LAG TIME,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
Arthur J. Askew.
Journal of Hydrology, Vol 10, No 3, p 225-242, Apr 1970. 18 p, 6 fig, 2 tab, 13 ref.

Descriptors: *Flood routing, *Time lag, Small watersheds, Flood forecasting, Hydrograph analysis, Hydraulics, Open channel flow, Discharge (Water), Floods, Equations, Mathematical studies.
Identifiers: Lag time formulae.

Formulae are developed which permit the computation of lag time for a catchment as a variable dependent on flood magnitude. Nonlinearity, as demonstrated by the variation in lag, differs little from catchment to catchment, and what difference there is can only be weakly related to the catchment's characteristics. A highly simplified analysis of the stream channels indicates that they are subject to a nonlinear hydraulic response of the same order of magnitude as that measured in the catchments as a whole. It is therefore suggested that the nonlinearity associated with the catchment areas is chiefly the result of that to be found in their channel systems. The absolute magnitude of lag time is highly correlated with catchment area and slope. This correlation leads to the development of three formulae for use with ungaged catchments which closely resemble those developed in the past for the estimation of a constant lag time. (Knapp-USGS)
W70-08212

RETURN PERIODS IN THE PRESENCE OF PERSISTENCE,
Lancaster Univ., Bailrigg (England). Dept. of Mathematics.
E. H. Lloyd.
Journal of Hydrology, Vol 10, No 3, p 291-298, Apr 1970. 8 p.

Descriptors: *Flood forecasting, *Markov processes, *Probability, *Frequency analysis, Statistical methods, Stochastic processes, Streamflow forecasting.
Identifiers: Flood frequencies.

Defining an n-year flood as one for which the return period, i.e. the expectation of the interval T between floods is $n = 1/p$ years, the statistical variability of T is considered in the two cases where the statistical properties of the river flows in different years are (1) mutually independent and (2) serially correlated by means of a Markov Chain. (Knapp-USGS)
W70-08214

BEHAVIOR OF ANNUAL FLOODS IN LIMESTONE BASINS IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
Elizabeth L. White, and Brian M. Reich.
Journal of Hydrology, Vol 10, No 2, p 193-198, Feb 1970. 6 p, 4 fig, 4 ref.

Descriptors: *Floods, *Surface-groundwater relationships, *Karst, *Pennsylvania, Hydrogeology, Aquifers, Limestones, Caves, Fissures (Geology), Geology, Springs, Small watersheds.
Identifiers: Mean annual flood.

The relations between flood data and watershed features were examined in small basins in Pennsylvania. The specific flood parameter used was the mean of the annual series of floods, which corresponds to the flood with a recurrence interval of 2.33 years. Extremely low mean annual floods occurred where there was extensive thick limestone above base level within the basin. The explanation is that storm excess waters enter the groundwa storage and then resurge slowly over the next t days. This results in lower floods for a given siz carbonate basin. (Knapp-USGS)
W70-08217

TURBULENCE MEASUREMENTS IN LIQUI USING AN IMPROVED TOTAL PRESSU PROBE,
Massachusetts Inst. of Tech., Cambrid Hydrodynamics Lab.
For primary bibliographic entry see Field 07B.
W70-08226

DETERMINATION OF CHANNEL CAPACI OF THE TUOLUMNE RIVER DOWNSTRE FROM LA GRANGE, STANISLAUS COUNT CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. C. Blodgett, and Hugh T. Mitten.
US Geological Survey Open-file report, 1970. 38 10 fig, 5 plate, 4 tab, 6 ref, 5 append.

Descriptors: *Floods, *Stage-discharge relatio Flood plains, *Backwater, *California, Flood co trol, Flood protection, Non-structural alternativ Historic flood, Frequency analysis, Hydrolo data, Data collections, Profiles, Probability.
Identifiers: Modesto (Calif), Tuolumne Riv (Calif), Flood profiles, Flood frequencies, Inund tion.

The adequacy of a 52-mile reach of the Tuolum River, Calif. to carry flood flows is described in channel capacity report based on records streamflow, historical and computed flood heigh and recorded backwater conditions. Maps, phot graphs, profiles, cross-sections, stage-dischar relations, and a backwater probability curve, i dicate the extent of flooding that has occurred a may be expected to occur in the future. The flo data may be used to define the primary flood-wa and minimize vulnerability to flood damages control of flood plain use through formulation flood plain regulations, zoning regulations, a building codes. The report is intended to assist i dividuals, industry, and government in the planni of recreational, waste disposal, and flood prote tion facilities. (Knapp-USGS)
W70-08237

FLOOD PROFILE STUDY, MORGAN CREE LINN COUNTY, IOWA,
Geological Survey, Iowa City, Iowa.
Harlan H. Schwob.
US Geological Survey Open-file report, May 197 16 p, 10 plate, 3 ref.

Descriptors: *Floods, *Iowa, *Flood plain zonin *Profiles, Water levels, Stage-discharge relation Flood protection, Flood plains, Water resource development, River basin development, Urbaniza tion.
Identifiers: Cedar Rapids (Iowa), Linn Coun (Iowa), Morgan Creek (Iowa).

Profiles were computed for a large flood of Morga Creek, Iowa under existing conditions and for smaller flood for two assumed conditions of en croachment. Flood-plain management can benef from this type of information during future expan sion of the Cedar Rapids urban area. Morga Creek is a small right-bank tributary of the Ceda River near the northwestern part of Cedar Rapid The area drained at the mouth is 18.9 square mile -approximately two-thirds of which is in Lin County and the remainder, 6.71 square miles, is i Benton County. The land in the basin is gentl rolling and is now virtually all used for agricultur purposes. Standard methods of step-backwate computation were used to define water-surfac profiles for the larger flood discharge that define the inundation level. (Knapp-USGS)
W70-08247

PEN CHANNEL APPLICATIONS FOR ILUTE POLYMER SOLUTIONS,
ueen's University of Belfast (Northern Ireland).
ept. of Civil Engineering.
or primary bibliographic entry see Field 08B.
/70-08257

ROBABILITY CHARACTERISTICS OF THE REEZE-UP AND BREAKUP DATES OF IVERS,
or primary bibliographic entry see Field 02C.
/70-08267

ISTRIBUTION OF ESTIMATES OF QUAN-ILES COMPARED BY DIFFERENT METHODS AS APPLIED TO STREAMFLOW COMPUTA-IONS),
e. G. Blokhinov.
ransl from Trudy Gos. Gidrol. Inst-ta, No 162, p 8-36, 1969. Soviet Hydrology: Selected Papers, ssue No 1, p 11-26, 1969. 16 p, 8 fig, 4 tab, 6 ref.

Descriptors: *Statistical methods, *Data processing, *Hydrologic data, *Sampling, Probability, Runoff forecasting, Streamflow forecasting, Flood forecasting.
Identifiers: Quantile computations.

Different methods for evaluating the parameters of the probability distribution of runoff are described on the basis of observational data and the methods most applicable to river runoff are selected. Analysis of the characteristics of sampling distributions involves: (a) evaluation of standard distribution parameters; (b) evaluation of the quantiles applicable to computations of runoff, water discharges or volumes of different excess probability; and (c) evaluation of more complex functions of distribution parameters. Evaluations of the quantiles were computed and compared using: (1) moments methods; (2) maximum likelihood method applicable to a gamma distribution; and (3) a number of new methods developed during recent years which are close in accuracy to the maximum likelihood method. (Knapp-USGS)
W70-08270

FUNDAMENTAL PRINCIPLES OF THE METHOD FOR COMPUTING MAXIMUM RUNOFF,
S. N. Kritskiy, and M. F. Menkel.
Trudy Gos. Gidrol. Inst-ta, No 162, p 3-17, 1969. Soviet Hydrology: Selected Papers, Issue No 1, p 1-10, 1969. 10 p, 3 fig, 1 tab, 7 ref.

Descriptors: *Reservoir design, *Streamflow forecasting, *Probability, River forecasting, Frequency analysis, Design flow, Design flood, Design standards, Statistical methods.
Identifiers: USSR.

The concept used as a theoretical basis of computations at the present stage in the USSR in climatology and hydrology is the concept of streamflow fluctuations as a random process. An estimate of the possible future maximum water discharges becomes definite only to the extent to which the discharge corresponds to its excess probability. All methods for computing maximum water discharge are based on an analysis of data on maximum runoff and the meteorological phenomena causing it as observed in the past. The criterion for determining maximum water discharge is the annual probability that this quantity will be exceeded. Information on fluctuations of maximum water discharge is limited for each individual river to the number of years during which hydrometric observations have been made. The reservoir design philosophy of the USSR is explained and reviewed. (Knapp-USGS)
W70-08271

FLOODS ON ROCK RIVER IN NORTHERN ROCK COUNTY, WISCONSIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W70-08283

FLOODS IN BEDEN BROOK BASIN IN SOMERSET AND MERCER COUNTIES, NEW JERSEY,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W70-08284

FRESHWATER ECOLOGY IN THE MATO GROSSO, CENTRAL BRAZIL I. THE CONDUCTIVITY OF SOME NATURAL WATERS,
Westfield Coll, London (England). Dept. of Zoology.
J. Green.
Journal of Natural History, Vol 4, p 289-299, 1970. 6 fig, 7 tab, 11 ref.

Descriptors: *Conductivity, *Tropical regions, *Impact (Rainfall), *Precipitation (Atmospheric), *Runoff, Calcium, Water properties, Hydrologic cycle, Streams, Meanders, Percolation, Sodium.
Identifiers: *Brazil, *Mato grosso, Cerrado.

The conductivities of streams, meander lakes, rainfall, and runoff water were measured in a region of the Mato Grosso. The streams and meander lakes had low conductivities with one exception, which was subject to much evaporation. Rainfall water showed higher conductivities than streams, and large variations, even during a single rainfall. The conductivities of later rains decreased relative to earlier rains, and convectional rains showed less variation than passing fronts. Runoff water passing through vegetation or cleared sites had higher conductivity than the rainfall water, indicating ions were added from the soil and plants, and this was accompanied by short-term fluctuations in the conductivities of small streams. Percolating water had lower conductivities, presumably due to loss of ions to the soil. Rainfall also had a high Ca to Na ratio and it was estimated that over a 2 month period it supplied the region with at least 4 kilograms of Ca per hectare. The probable sources of the ions in the rainwater are considered, and it is felt that wide spread burning during the dry season may be a major source because of the dispersion of large amounts of ash into the atmosphere. The hydrological cycle in the Mato Grosso probably effects a considerable amount of mineral recycling in plants and soils. (Casey-Arizona)
W70-08346

NUMERICAL SIMULATION OF WATERSHEDS USING PHYSICAL SOIL PARAMETERS,
Texas Univ., Austin; and Texas Tech Univ., Lubbock.
Walter L. Moore, and Bill J. Claborn.
13th Congress International Association for Hydraulic Research Proceedings, Vol 1, p 211-219, Aug-Sept 1969. 9 p, 4 fig, 9 ref.

Descriptors: Water resources development, Flow rates, Reservoirs, Soil moisture, Stream gages, *Streamflow records, Evapotranspiration, Digital computers, Simulation, Overland flow, *Watersheds (Basin), Hydrographs, *Runoff, Groundwater movement, Computer programs, Rainfall, Evaporation, Infiltration, Depression storage.
Identifiers: Stream gaging station, *Hydrologic models, Soil moisture movement, Pore size, *Stanford Watershed Model.

The best possible information on the amount and timing of streamflow is necessary for planning water resource developments. Limited information is available from stream gaging data, but information is needed at other points where no records, or records of very short duration, are available. Developing reliable and practical methods of hydraulic simulation offers one of the most promising methods for obtaining the necessary additional information. The advent of high-speed digital computers employing numerical models of the entire runoff process for a watershed has made hydrologic simulation feasible. One of the first and most successful simulation programs, the Stanford Watershed Model, is discussed. Revisions to the model have been made at the University of Texas at Austin to make the simulation of infiltration and soil moisture movement correspond more closely to the physical processes. In the modified model, the parameters representing the watershed are related to the physical quantities, and it is hoped that they can be related to measurable characteristics of the watershed. (USBR)
W70-08450

INDIRECT DETERMINATION OF SYNTHETIC RUNOFF,
Agricultural Research Service, Chickasha, Okla.
Donn G. DeCoursey, and Edward H. Seely.
13th Congress International Association Hydraulic Research Proceedings, Vol 1, p 123-131, Aug-Sept 1969. 9 p, 3 fig, 1 tab, 6 ref.

Descriptors: *Synthetic hydrology, *Runoff, Runoff forecasting, Land use, Rainfall, *Rainfall-runoff relationships, Evaporation, Hydrology, Watershed management, Watersheds (Basins), *Mathematical models.
Identifiers: Stochastic models, Deterministic model, *Hydrologic models, Computer applications.

Synthetic sequences of daily storm runoff have been generated for a 1110-acre watershed in Texas. The system is used to generate the runoff and is composed of deterministic and stochastic elements. The watershed model--a function of land use, soil moisture, and evaporation--is deterministic in that a functional relationship exists between the inputs to the model and the model response. The model is not entirely deterministic because a probabilistic element fitted to the unexplained variance of the watershed response is included. Inputs to the system are stochastic and consist of daily rainfall and evaporation. A 2-state Markov chain of transition probabilities was used to calculate the occurrence or nonoccurrence of rainfall. The amount of rainfall was uncorrelated with previous rainfall or length of dry period. Monthly evaporation was correlated with the previous month's evaporation and present month's rainfall. Various statistical tests verified the adequacy of the methods used. Several synthetic sequences of runoff were generated with the watershed in 2 different land uses. The system can be used to study the relationship between land use, rainfall regime, length of record, and flood frequency. (USBR)
W70-08455

DESIGN FLOOD DETERMINATION IN SOUTH AFRICA,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering.
D. C. Midgley, R. A. Pullen, and W. V. Pitman.
Witwatersrand University Hydrological Research Unit Report No 4/69, December 1969. 66p, 34 fig, 38 tab, 8 append.

Descriptors: *Flood forecasting, *Flood routing, *Design flood, Rational formula, Routing, Time lag, Unit hydrographs, Rainfall-runoff relationships, Synthetic hydrology, Depth-area-duration analysis, Design storm.
Identifiers: *South Africa.

Design floods were calculated for most South African streams. For catchments up to about 5 square miles in area the conventional method of determining the peak discharge is by use of the Rational Formula. For determination of design output from catchments from 5 sq mi to about 2000 sq mi in area the unitgraph approach is recommended. Unitgraphs should not be synthesized for catchments larger than about 2000 sq mi. Although the design storm should be synthesized for the problem catchment as a whole, the catchment should then be subdivided into convenient sub-catchments, none exceeding 2000 sq mi in area, and unitgraphs synthesized for each. Application of the appropriate parts of the effective design storm to these unitgraphs yields a flood hydrograph at the mouth of each sub-catchment. These separate flood hydrographs must then be lag-routed in turn to the problem site. (Knapp-USGS)
W70-08464

PRECIPITATION, STREAMFLOW, AND MAJOR FLOODS AT SELECTED SITES IN THE GILA RIVER DRAINAGE BASIN ABOVE COOLIDGE DAM, ARIZONA,
Geological Survey, Washington, D.C.
D. E. Burkham.
For sale by Superintendent of Documents, US Government Printing Office, Washington, DC 20402. Price $0.50. US Geological Survey Professional Paper 655-B, 1970. 33 p, 23 fig, 5 tab,22 ref.

Descriptors: *Streamflow, *Rainfall-runoff relations, *Floods, *Arizona, Discharge (Water), Evapotranspiration, Phreatophytes, Surface waters, Climates, Precipitation (Atmospheric), Regime, Alluvial channels, Channel morphology.
Identifiers: Gila River Phreatophyte Project.

The Gila River Phreatophyte Project is a water-budget study to measure evapotranspiration from a 15-mile reach of the Gila River flood plain above Coolidge Dam in southeastern Arizona. Its principal purpose is to determine how much the water yield of the project area can be increased by replacing deep-rooted nonbeneficial woody plants with shallow-rooted beneficial grasses. There has been a fluctuating decline in annual precipitation and an almost continual decline in annual runoff since 1920. The decrease in precipitation has been mainly during the winter (November through April) and has resulted in a lower incidence of major floods. Major floods occurred in nine winters in the period 1891-1916, but only one major flood (December 1965) occurred in the period 1917-65. No significant progressive decrease has occurred in the ratio of runoff to a given amount of precipitation since 1920, nor has there been a progressive increase in the streamflow losses from the Gila River in Safford Valley. (Knapp-USGS)
W70-08468

GROUNDWATER - SURFACE WATER RELATION DURING PERIODS OF OVERLAND FLOW,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 02A.
W70-08488

MEANDERING OF THE ARKANSAS RIVER SINCE 1833 NEAR BENT'S OLD FORT, COLORADO,
Geological Survey, Denver, Colo.
Frank A. Swenson.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402 - Price $3.25. In: Geological Survey Research 1970, Chapter B, US Geological Survey Professional Paper 700-B, p B210-B213, 1970. 4 p, 4 fig, 1 ref.

Descriptors: *History, *Meanders, *Alluvial channels, *Colorado, Erosion, Flood plains, Rivers, Surveys.
Identfiers: *Bent's Old Fort (Colo), *Arkansas River (Colo), National Historical Monuments.

Bent's Old Fort, constructed on the Santa Fe Trail in 1883 in southeastern Colorado, has been established as a National Historical Monument. The U.S. National Park Service is interested in determining the relative position of the fort, at the time it was occupied, to the meandering Arkansas River. Available data indicate there has been relatively little shift in the meanders of the river at this location. (Knapp-USGS)
W70-08490

TRENDS IN RUNOFF,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02B.
W70-08491

SYNTHETIC UNITGRAPHS FOR SOUTH AFRICA,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering.
R. A. Pullen.
Witwatersrand University Hydrological Research Unit Report No 3/69, December 1969. 201 p, 54 fig, 36 tab, 53 ref, 1 append.

Descriptors: *Unit hydrographs, *Routing, *Rainfall-runoff relationships, Duration curves, Depth-area-duration analysis, Hydrograph analysis, Synthetic hydrology, Data collections, Hydrologic data, Flood routing, Flood forecasting, Streamflow forecasting, Runoff forecasting.
Identifiers: *South Africa.

A method was developed for estimating the duration of excess rain and for deriving the unitgraph when the catchment rainfall that caused a significant flood rise is not measured. Nearly 600 flood events at 96 streamgages well spread over South Africa were analyzed by this method. Standard unitgraphs for each of the 96 selected catchments are compiled for a unitgraph library. Basin lags, estimated from the library unitgraphs, were correlated with physiographic characteristics represented in terms of a catchment index. South Africa was divided into nine zones displaying distinctive lag-physiography relationships. One-hour unitgraphs were derived from the library unitgraphs. Generalized dimensionless one-hour unitgraphs were calculated for each of the nine zones. Diagrams depicting the nine dimensionless one-hour unitgraphs are given as well as tabulations of the unitgraphs and the dimensionalizing parameters. (Knapp-USGS)
W70-08500

STRATIFIED RESERVOIR CURRENTS, PARTS 1 AND 2,
Oregon State Univ., Corvallis. Engineering Experiment Station.
For primary bibliographic entry see Field 02H.
W70-08501

QUANTITY AND CHEMICAL QUALITY OF LOW FLOW IN CIBOLO CREEK, TEXAS, MARCH 4-8, 1968,
Geological Survey, Austin, Tex.
William E. Reeves, and Harvey L. Kunze.
Texas Water Development Board Report 112, April 1970. 16 p, 3 fig, 3 tab, 4 ref.

Descriptors: *Low flow, *Water quality, *Texas, Sampling, Streamflow, Discharge (Water), Water chemistry, Water analysis, Data collections, Hydrologic data, Hydrogeology, Water pollution sources, Sewage, Sewage effluents.
Identifiers: Cibolo Creek (Tex).

The changes in quantity and inorganic chemical quality of base flow of Cibolo Creek, Texas, in the reach from the stream-gaging station at mile 89.6, downstream to a point 2.5 miles upstream from the mouth are described. The investigation was made during a period when evapotranspiration was at a minimum. Discharge increased in a downstream direction, from no flow at about mile 88 to 67.4 cfs at mile 2.5. Dissolved-solids concentrations also increased in a downstream direction throughout the reach. (Knapp-USGS)
W70-08509

QUANTITATIVE MORPHOLOGY OF THE DRAINAGE BASIN IN SEMI-ARID ENVIRONMENT,
Central Arid Zone Research Inst., Jodhpur (India).
Bimal Ghose, S. Pandey, and S. Singh.
Annals of Arid Zone, Vol 8, No 1, p 37-44, March 1969. 14 fig, 4 tab, 7 ref.

Descriptors: *Streams, *Basins, *Geologic mapping, *Lithification, Geological surveys, Arid lands, Geomorphology, Hydrogeology, Drainage density, Channel morphology.
Identifiers: *Bifurcation ratio, *Stream order, *India, *Rajasthan desert, *Drainage basins, Stream gradient, Relief ratio, Constant channel maintenance, Stream frequency, Basin order.

Twelve drainage basins in a semi-arid areas v randomly selected and studied using aerial m The basins were divided into 3 lithological grou granite, phyllite-schist-quartzite, and sandy o alluvium. Fourteen geomorphic characteri were determined for each group. A line drawin the topography of each basin is included. number of streams in a given basin decrease v increase in stream order; main stream length creases with increase in stream order. Howeve total lengths of each order are inversely relate the order. Stream length ratios did not vary v lithology but basin area ratios did. The ave values of most of the geomorphic characterisi did vary with lithology. (Casey-Arizona)
W70-08526

ROUTING MODIFICATIONS TO SUBURB DESIGN HYDROGRAPHS,
Pennsylvania State Univ., University Park. Dept Civil Engineering.
For primary bibliographic entry see Field 04A.
W70-08540

2F. Groundwater

GRAVITY INVESTIGATION OF THE WATE BEARING STRATA IN SWAN VALLEY, MO TANA,
Montana Univ., Missoula; and Montana Wa Resources Research Center, Bozeman.
Gary W. Crosby.
Completion Report, (1970). 2p. OWRR A-02 MONT (1).

Descriptors: *Gravity studies, *Groundwat Water-bearing strata, Montana.
Identifiers: Swan Valley (Montana).

The Swan Valley and contiguous portions of t Swan and Mission Ranges have been covered wi 325 gravity stations for a spacing density of o measurement per 1.25 sq. mi. Gravity data ha been processed through the computer and the Bouguer anomalies have been calculated an plotted. There is considerable irregularity in th gravity field, particularly at the south end. Inferrin an average porosity of 18 per cent from densi data, there are 27 cubic miles of pore space. If specific yield of 0.5 is assumed, there a 46,700,000 acre-feet recoverable, or about 1.2 10 to the 13th power gallons that may be produce It is believed that these figures are conservativ (Holje-University of Montana)
W70-08149

AEROMAGNETIC, GRAVITY, AND ELECTR CAL RESISTIVITY EXPLORATION BETWEE PAHALA AND PUNALUU, HAWAII,
Hawaii Univ., Honolulu. Water Resource Research Center.
For primary bibliographic entry see Field 07C.
W70-08154

AN EXAMPLE OF THE STUDY OF ISOTOPI HYDROLOGY IN A SEMI-ARID REGION, TH BASIN OF LAKE CHAD (IN FRENCH),
Office de la Recherche Scientifique et Techniqu Outre-Mer, Paris (France); United Nations Educa tional, Scientific and Cultural Organization, Pari (France). Office of Hydrology; and Groninge Rijksuniversiteit (Netherlands). Natuurkundi Laboratorium.
For primary bibliographic entry see Field 02K.
W70-08177

USE OF GROUNDWATER FOR IRRIGATION SEWARD COUNTY, NEBRASKA,
Nebraska Univ., Lincoln. Conservation and Surve Div.
For primary bibliographic entry see Field 04B.
W70-08179

LOGY AND GROUNDWATER OURCES OF SALEM COUNTY, NEW JER-

logical Survey, Trenton, N.J.
C. Rosenau, Solomon M. Lang, George S.
n, and James G. Rooney.
Jersey Division Water Policy and Supply Spe-
Report No 33, 1969. 142 p, 21 fig, 7 tab, 25
ppend.

criptors: *Water resources, *Groundwater,
uifers, *Saline water intrusion, *New Jersey,
er supply Withdrawal, Water yield, Water
ity, Surveys, Water levels, Water utilization,
logy, Hydrologic data, Data collections,
rogeology.
tifiers: Salem County (N J).

Potomac Group and Raritan and Magothy For-
ions contain the most productive aquifers in
m County, N.J. These aquifers are hydrauli-
y connected and form a single hydrologic unit
quifer system. Reported yields of wells tapping
system range up to 860 gpm. The highest yields
monly occur near the Delaware River. A
line in water levels resulted from heavy pump-
, and has created the danger of salt-water en-
achment into the aquifer from downdip areas
re the aquifer already contains saline water.
al chloride concentrations are as high as 2,057
n. Use of groundwater in Salem County in 1964
raged 12.28 mgd or nearly 200 gpd per person.
ustrial use was 5.33 mgd and use for public
ply was 2.74 mgd. Irrigation, which has become
reasingly important in recent years accounted
2.14 mgd. Average total summer use of ground-
er---approximately 17.7 mgd---was con-
erably higher than the yearly average. (Knapp-
GS)
70-08198

CONCEPTUAL MODEL OF THE GROUND-ATER REGIME AND THE HYDROGEOLOG-ENVIRONMENT,
search Council of Alberta, Edmonton.
r primary bibliographic entry see Field 02A.
70-08208

OTTING PAPER MODELS SIMULATING ROUNDWATER FLOW,
ricultural Univ., Wageningen (Netherlands).
J. Sevenhuysen.
rnal of Hydrology, Vol 10, No 3, p 276-281,
r 1970. 6 p, 5 fig.

scriptors: *Groundwater movement, *Hydraulic
dels, Model studies, Soil water movement, Infil-
tion, Saturated flow, Leaching.
ntifiers: Blotting paper models.

demonstrate water flow in a cross-sectional
del, use can be made of a heavy blotting paper.
is material is easily cut into any shape, lines can
drawn on it, and samples can be taken out. The
eets of blotting paper, forming the model, are
ng vertically, the flow is introduced by saturated
eets placed vertically or horizontally as required.
nulation of infiltration, saturated flow and
aching is described. (Knapp-USGS)
70-08213

MARYLAND COASTAL AQUIFER,
aryland State Geological Survey, Baltimore.
r primary bibliographic entry see Field 02L.
70-08227

RITICAL EVALUATION OF CERTAIN ETHODS OF UNSTEADY GROUNDWATER YDRAULICS,
isconsin Univ., Milwaukee; and Northwestern
niv., Evanston, Ill. Dept. of Civil Engineering.
abor M. Karadi, Raymond J. Krizek, and Manual
chea.
ater Resources Bulletin, Vol 6, No 3, p 424-438,
ay-June 1970. 15 p, 8 fig, 13 ref.

Descriptors: *Groundwater movement, *Hydrogeology, *Unsteady flow, *Mathematical studies, *Reviews, Equations, Darcys law, *Analytical techniques, Dupuit-Forchheimer theory, Steady flow, Laplaces equation, Numerical analysis.
Identifiers: Unsteady groundwater flow.

The basic theories and fundamental assumptions usually employed in the solution of unsteady groundwater flow problems are reviewed critically. The best known method of analysis for such problems is based on the Dupuit-Forchheimer approximation and leads to a nonlinear parabolic differential equation which is generally solved by linerization or numerical methods. The accuracy of the solution to this equation can be improved by use of a different approach which does not employ the Dupuit-Forchheimer assumption, but rather is based on a seminumerical solution of the Laplace equation for quasi-steady conditions. The actual unsteady process is replaced by a sequence of steady-state conditions, and it is assumed that the actual unsteady flow characteristics during a short time interval can be approximated by those associated with 'average' steady state flow. The Laplace equation is solved by a semidiscretization method according to which the horizontal coordinate is divided into subintervals, while the vertical coordinate is maintained continuously. The proposed method is applied to a typical tile drainage problem, and, based on a comparison of calculated results with experimental data, the method is evaluated and practical conclusions regarding its applicability are advanced. (Knapp-USGS)
W70-08230

STATISTICAL ANALYSIS OF GROUNDWATER USE AND REPLENISHMENT,
Missouri Univ., Rolla. Dept. of Geological Engineering; and Colorado State Univ., Ft. Collins. Dept. of Geology.
For primary bibliographic entry see Field 04B.
W70-08231

THE HYDROGEOLOGIC PARAMETER MU AND A METHOD FOR COMPUTING GROUNDWATER STORAGE,
Akademiya Nauk SSSR. Institut Geologii.
For primary bibliographic entry see Field 07B.
W70-08266

THE THEORY OF GROUNDWATER MOTION AND RELATED PAPERS,
M. King Hubbert.
New York, NY, Hafner Publishing Co, Inc, 1969. 310 p, 103 fig.

Descriptors: *Darcys law, *Groundwater movement, Porous media, Hydraulic conductivity, Laplaces equation, Mathematical studies, Percolation, Potential flow, Saturated flow, Theis equation, Thiems equation, Hydrodynamics.
Identifiers: Groundwater flow laws.

Groundwater movement is discussed in a reprint collection of four papers including Darcy's paper of 1856 in which Darcy's law was first published. The papers are: The Theory of Groundwater Motion (1940), Entrapment of Petroleum under Hydrodynamic Conditions (1953), Darcy's Law and the Field Equations of the Flow of Underground Fluids (1957), by M. K. Hubbert; and Determination des lois d'ecoulement de l'eau a travers le sable (1856) by Henry Darcy. Some errors in the earlier versions of the papers were corrected. (Knapp-USGS)
W70-08279

WATER RESOURCES OF THE ARID LANDS,
Aberdeen Univ. (Scotland).
For primary bibliographic entry see Field 04B.
W70-08351

STATUS AND TRENDS IN LOGGING,
Marathon Oil Co., Littleton, Colo.
For primary bibliographic entry see Field 08E.
W70-08446

HYDROGEOLOGY OF THE UPPER SILVER BOW CREEK DRAINAGE AREA, MONTANA,
Montana Bureau of Mines and Geology, Butte.
Maxwell K. Botz.
Available from the Clearinghouse as PB-193 025, $0.65 in microfiche; paper copy available from Montana Bureau of Mines and Geology, Butte, $0.35. Montana Bureau of Mines and Geology Bulletin 75, September 1969. 32 p, 6 fig, 10 tab, 2 plate, 22 ref. OWRR A-012 MONT (1).

Descriptors: *Water resources, *Groundwater, *Hydrogeology, *Montana, Alluvium, Aquifers, Water supply, Water yield, Water quality, Recharge water, Groundwater movement.
Identifiers: Silver Bow Creek (Montana).

Geologically, the Upper Silver Bow Basin, Montana is entirely within the Boulder batholith. Granitic rocks and alluvium derived from their weathering are, by far, the most abundant geological materials in the area. A 23 square mile alluvial filled valley south of Butte is the principal aquifer in the area. Alluvium in most of the area will yield sufficient water for domestic and stock use and in selected areas will yield several hundred gallons per minute to wells. Fractured rock in many places yields sufficient water for domestic and stock use. Streams entering the alluvial valley are the principal source of groundwater recharge. About 440,000 acre-feet of groundwater is in storage within the upper 200 feet of saturated alluvium. Movement of groundwater in the alluvial aquifer is northward at a gradient of about 15 feet per mile. There has been little net change in the configuration of the water table in the last 55 years. Scattered data indicate little annual fluctuation of the water table. Water quality is generally good; and the water is of the calcium bicarbonate type. (Botz-Montana)
W70-08463

THE RAFT RIVER BASIN, IDAHO-UTAH, AS OF 1966: A REAPPRAISAL OF THE WATER RESOURCES AND EFFECTS OF GROUNDWATER DEVELOPMENT,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 04B.
W70-08466

RECORDS OF WATER LEVELS AND CHEMICAL ANALYSES FROM SELECTED WELLS IN PARTS OF THE TRANS-PECOS REGION, TEXAS, 1965-68,
Geological Survey, Austin, Tex.
M. E. Davis, and J. D. Gordon.
Texas Water Development Board Report 114, April 1970. 49 p, 9 fig, 7 tab, 11 ref.

Descriptors: *Groundwater, *Texas, *Hydrologic data, *Water levels, *Water quality, Water yield, Saline water, Irrigation water, Salinity, Water chemistry, Water yield, Data collections, Leaching, Infiltration, Percolation.
Identifiers: Trans-Pecos region (Tex).

Current information on water levels and the chemical quality of water in selected wells in the Trans-Pecos area of Texas is presented. Much of the information was collected in the heavily developed Salt basin and is particularly useful in evaluating the effects of large scale groundwater development. A substantial part of groundwater pumped in the area is for irrigation, most of which is in the Salt basin. On the basis of acreage irrigation, pumping rates, power tests, and records of fuel consumption, about 128,000 acre-feet of water was pumped in the Salt basin in 1967. Of this amount, 105,000 acre-feet was pumped in the Dell City subarea. In general, the quality of groundwater within the Salt basin becomes increasingly more mineralized northward. In the Lobo Flats-Chispa subarea, the

water is low in dissolved solids but high in percent sodium, a condition that has reduced the permeability of the subsoil. The concentration of dissolved solids in the more heavily pumped part of the Dell City subarea now ranges from at least 1,550 mg/l to more than 6,000 mg/l. The water is usable for irrigation, however, largely because of the high permeability of the soils. (Knapp-USGS)
W70-08480

TRANSMISSIVITY AND STORAGE COEFFICIENT OF AQUIFERS IN THE FOX HILLS SANDSTONE AND THE HELL CREEK FORMATION, MERCER AND OLIVER COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
Mack G. Croft, and E. A. Wesolowski.
For sale by the Superintendent of Documents U.S. Government Printing Office, Washington, D.C. 20402 - Price $3.25. In: Geological Survey Research 1970, Chapter B, US Geological Survey Professional Paper 700-B, p B190-B195, 1970. 6 p, 1 fig, 1 tab, 12 ref.

Descriptors: *Transmissivity, *Storage coefficient, *Aquifers, *North Dakota, Water resources, Stock water, Water wells, Artesian wells, Hydrogeology, Water yield, Permeability, Discharge (Water).
Identifiers: Mercer County (ND), Oliver County (ND), Fox Hills Sandstone, Hell Creek Formation.

Since 1963, about 100 flowing stock and domestic wells have been drilled into the Fox Hills Sandstone and the Hell Creek Formation in Mercer and Oliver Counties, N. Dak. Aquifer tests were made on about half of the wells. The values obtained for transmissivity range from 13 to 3,100 gallons per day per foot, and average 510 gallons per day per foot. An analysis of the potentiometric surface in the southwestern part of Mercer County indicates a transmissivity of about 1,400 gallons per day per foot. The values for permeability average 16 gallons per day per square foot. Data indicate storage coefficient values are between 0.0001 and 0.00001. The aquifer tests indicate that the wells have specific capacities that range from less than 0.1 to 0.6 gallon per minute per foot. (Knapp-USGS)
W70-08485

PRELIMINARY ANALYSIS OF RATE OF MOVEMENT OF STORM RUNOFF THROUGH THE ZONE OF AERATION BENEATH A RECHARGE BASIN ON LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y.
G. E. Seaburn.
For sale by the Superintendent of Documents U.S. Government Printing Office, Washington, D.C. 20402 - Price $3.25. In: Geological Survey Research 1970, Chapter B, US Geological Survey Professional Paper 700-B, p B196-B198, 1970. 3 p, 3 fig, 1 tab, 2 ref.

Descriptors: *Artificial recharge, *Unsaturated flow, *Infiltration, *New York, Soil water movement, Groundwater movement, Storm runoff, Urbanization, Cities, Pit recharge.
Identifiers: Long Island (NY).

A study of recharge basins on Long Island has provided information on the rate of movement of water through the zone of aeration. Pertinent data were collected during 38 storms from a basin in central Nassau County, where the depth to the water table is 35 feet below the bottom of the basin. In this basin the apparent downward rate of movement averaged 5.0 feet per hour; it ranged from an average of 3.0 feet per hour for storms in November through March to an average of 6.0 feet per hour for storms in April through October. (Knapp-USGS)
W70-08486

GROUNDWATER INFLOW TOWARD JORDAN VALLEY FROM UTAH VALLEY THROUGH VALLEY FILL NEAR THE JORDAN NARROWS, UTAH,
Geological Survey, Salt Lake City, Utah.
R. W. Mower.
For sale by the Superintendent of Documents US Government Printing Office, Washington, D.C. 20402 - Price $3.25. In: Geological Survey Research 1970, Chapter B, US Geological Survey Professional Paper 700-B, p B199-B202, 1970. 4 p, 3 fig, 4 ref.

Descriptors: *Groundwater movement, *Alluvium, *Aquifers, *Utah, Hydraulic conductivity, Permeability, Transmissivity, Water levels, Surveys, Seismic studies, Electrical resistance, Geophysics, Investigations.
Identifiers: Valley-fill alluvium, Utah Valley.

About 2,500 acre-feet of groundwater annually is moving generally northward from Utah Valley toward Jordan Valley through unconsolidated valley fill near the Jordan Narrows, Utah. The computation of underflow was made at a section in which the saturated fill averages about 125 feet in thickness and is between 2,700 and 4,000 feet wide. The fill consists of sediments ranging from clay to coarse gravel in size, and it has an average hydraulic conductivity of about 3,200 cubic feet per day per square foot. Underlying and bounding the fill on the east and west sides of the narrows are semiconsolidated or consolidated rocks of low average hydraulic conductivity through which there is little underflow. (Knapp-USGS)
W70-08487

GROUNDWATER - SURFACE WATER RELATION DURING PERIODS OF OVERLAND FLOW,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 02A.
W70-08488

WATERBORNE STYRENE IN A CRYSTALLINE BEDROCK AQUIFER IN THE GALES FERRY AREA, LEDYARD, SOUTHEASTERN CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 05B.
W70-08489

THE RELATIONSHIP BETWEEN SURFACE WATER AND GROUNDWATER IN SHIP CREEK NEAR ANCHORAGE, ALASKA,
Geological Survey, Anchorage, Alaska.
John B. Weeks.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402 - Price $3.25. In: Geological Survey Research 1970, Chapter B, US Geological Survey Professional Paper 700-B, p B224-B226. 3 p, 3 fig, 1 tab, 4 ref.

Descriptors: *Surface-groundwater relationships, *Recharge, *Aquifers, *Alaska, Alluvial channels, Glacial drift, Alluvium, Groundwater basins, Bank storage, Base flow, Discharge (Water), Seepage.
Identifiers: Anchorage (Alaska).

Ship Creek drainage basin is an important recharge area for the Anchorage artesian aquifer. Discharge records show Ship Creek loses an average of 25 cfs in the recharging area and gains about 22 cfs in the reach below the recharge area. A water-budget analysis demonstrates that of this gain at least 11 cfs is groundwater return flow from the recharge area. (Knapp-USGS)
W70-08492

PRAIRIE POTHOLES AND THE WATER TABLE,
Geological Survey, Denver, Colo.
C. E. Sloan.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402 - Price $3.25. In: Geological Survey Research 1970, Chapter B, US Geological Surv
Professional Paper 700-B, p B227-B231, 1970. 5
6 fig, 1 tab, 3 ref.

Descriptors: *Surface-groundwater relationshi
*Potholes, *Grasslands, *Water table, *Wa
level fluctuations, Water quality, Aquifer
Groundwater movement, North Dakota, Glaci
drift, Lakes.
Identifiers: Prairie Potholes.

Prairie potholes, or sloughs, are water-holdi
depressions of glacial origin that occur in the pr
ries of the northern conterminous United Stat
and southern Canada. The water table in t
prairie-pothole region is a shallow surface that isi
subdued image of the general topography. In deta
however, small variations in topography are n
reflected, and in cross sections the water table is a
most a straight line linking pothole water surface
Salinity and permanence of contained water diffi
widely among potholes and are influenced
groundwater flow which, in turn, is partially depe
dent on the configuration of the water table su
rounding the pothole. Groundwater inflo
throughflow, and outflow result when the adjace
water table is correspondingly high, intermediat
and low. Relative permanence and salinity increas
or decrease as net groundwater movement rang
from inflow to outflow. (Knapp-USGS)
W70-08493

2G. Water in Soils

**USING SOIL MAPS TO DELINEATE FLOOD
PLAINS IN A GLACIATED LOW-RELIE
LANDSCAPE,**
Wisconsin Univ., Madison. Dept. of Soil Science.
Dale E. Parker, Gerhard B. Lee, and Douglas A. Yanggen.
Journal of Soil and Water Conservation, Vol 2
No 3, p 96-99, May-June 1970. 4 p, 3 fig, 2 tab,
ref.

Descriptors: *Mapping, *Flood plains, *Aeria
photography, *Soil surveys, Floods, Drainage, Soi
water, Alluvium, Soil types, Soil investigations
Soil-water-plant relationships.
Identifiers: Flood plain mapping.

Floodplain boundaries determined by engineering
methods were superimposed on detailed soil map
along two reaches of the Root River watershed in
southeastern Wisconsin. A comparison of the pre-
dicted flood boundaries with soil boundaries
showed that alluvial soils are subject to frequen
flooding. In addition, other soils adjacent to or con-
nected with the alluvial bottomlands were suscepti-
ble to flooding in varying degrees. The most poorly
drained soils were, in general, the most likely to
flood. (Knapp-USGS)
W70-08183

**EFFECT OF ANTECEDENT SOIL WATER ON
PRESEASON RAINFALL STORAGE IN A
SLOWLY PERMEABLE IRRIGATED SOIL,**
Agricultural Research Service, Bushland, Tex.
Southwestern Great Plains Research Center.
J. T. Musick.
Journal of Soil and Water Conservation, Vol 25,
No 3, p 99-101, May-June, 1970. 3 p, 3 fig, 1 tab, 6
ref.

Descriptors: *Infiltration, *Water storage, *Soil
water, *Antecedent precipitation, Rain-fall-runoff
relationships, Permeability, Irrigation, Texas,
Water levels, Storage coefficient, Soil-water-plant
relationships, Water conservation.
Identifiers: Antecedent soil water.

Preseason rainfall storage declined from the 30-
percent to 50-percent level when the soil profile
was dry after harvest to less than 10 percent when
the soil was wet. This emphasizes the importance of
an early irrigation cutoff date (not later than early
grain filling) to largely deplete soil moisture before

arvest and provide storage capacity for expected reseason rainfall in the Southern High Plains, Tex-s. (Knapp-USGS)
W70-08184

EVAPOTRANSPIRATION MEASUREMENT BY CHLORIDE TRANSLOCATION,
Agricultural Research Service, Reno; Nev. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02D.
W70-08210

WATER QUALITY EFFECTS OF LEACHING FROM SUBMERGED SOILS,
National Field Investigations Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05B.
W70-08218

EVALUATION OF THE INTRINSIC-PENETRABILITY AND -DIFFUSIVITY CONCEPTS TO PREDICT HORIZONTAL INFILTRATION IN POROUS MEDIA,
California Univ., Riverside. Department of Soils and Plant Nutrition.
M. A. Mustafa, J. Letey, and C. L. Watson.
Soil Science Society of America Proceedings, Vol 34, No 3, p 369-372, May-June 1970. 4 p, 5 fig, 2 tab, 16 ref.

Descriptors: *Soil water movement, *Diffusivity, *Infiltration, *Wettability, Surface tension, Organic matter, Surfactants, Wetting, Laboratory tests, Organic compounds, Viscosity.
Identifiers: *Water-repellent soils.

Horizontal infiltration of nine organic liquids and 0.01N calcium sulfate into glass beads and wettable and water-repellent soils was conducted to study the concepts of intrinsic penetrability and diffusivity. The concepts were found to apply to the two wettable porous media and all liquids considered. The concepts apply to the organic liquids but not to the 0.01N calcium sulfate in the water-repellent medium. (Knapp-USGS)
W70-08219

MEASUREMENT OF THE TOTAL SUCTION OF SOILS BY A THERMISTOR PSYCHROMETER,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
B. D. Kay, and Philip F. Low.
Soil Science Society of America Proceedings, Vol 34, No 3, p 373-376, May-June 1970. 4 p, 5 fig, 15 ref.

Descriptors: *Soil moisture meters, *Temperature, *Humidity, *Vapor pressure, Instrumentation, Osmosis, Thermodynamics, Osmotic pressure, Calibrations, Clays, Soils.
Identifiers: *Thermistor physchrometer.

A detailed description of a thermistor psychrometer is presented. The psychrometer depends on differential cooling due to unequal evaporation rates of water droplets suspended from matched thermistors which are located above the sample and reference. The resulting difference in resistance between the thermistors is measured by a Wheatstone bridge and referred to a calibration curve for the determination of the total suction of the sample. Results obtained by the psychrometer on a Brookston silt loam are shown to agree with those obtained by a pressure plate. However, results obtained by the phychrometer on a pure clay-water system are shown to differ from those obtained by a tensiometer. A possible reason for this difference is given. (Knapp-USGS)
W70-08220

ANALYSIS OF RADIAL, STEADY-STATE SOLUTION, AND SOLUTE FLOW,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.; and Illinois Univ., Urbana. Dept. of Soil Physics.
Frank D. Whisler, Arnold Klute, and Richard J. Millington.
Soil Science Society of America Proceedings, Vol 34, No 3, p 382-387, May-June 1970. 6 p, 13 fig, 15 ref.

Descriptors: *Soil water movement, *Root zone, Diffusion, Soil-water-plant relationships, Hydraulic conductivity, Soil moisture, Moisture tension, Moisture uptake.
Identifiers: Flow to roots, Radial flow.

Equations which describe steady-state solution and solute flow to a root were solved in a seminumerical-analytical manner subject to fixed tensions and concentrations at the inner and outer radial boundaries. Tension, solution content, and solute concentration profiles are shown for conductivity and diffusion coefficients which vary with saturation. Fluxes of solution and solute are calculated for several boundary conditions. Limiting solution fluxes are predicted. (Knapp-USGS)
W70-08221

PREDICTING MOISTURE DISTRIBUTIONS IN REWETTED SOILS,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
W. J. Staple.
Soil Science Society of America Proceedings, Vol 34, No 3, p 387-392, May-June 1970. 6 p, 8 fig, 14 ref.

Descriptors: *Infiltration, *Percolation, *Wetting, *Hysteresis, *Soil water movement, Hydraulic conductivity, Unsaturated flow, Soaking, Diffusivity, Drying, Laboratory tests, Capillary action, Soil physical properties.
Identifiers: Soil rewetting.

Computed and measured soil moisture distributions were compared during second and third cycles of infiltration and redistribution. In order to obtain acceptable agreement, the hydraulic conductivity had to be reduced to about one-half of the value used in the first cycle for freshly packed soil. One method was to correct the conductivity by trial and error. The other was to measure the conductivity of the soil after it had been carried through an initial wetting and drying cycle. Hysteretic effects on rewetting were minimized by adding sufficient water to the partially dried soil to bring it back to its initial wetted condition. The independent domain theory was found satisfactory for providing wetting tension data during the brief infiltration period. Modified tension scanning curves for drying were used in second-cycle computations for clay soil but the original curves for freshly packed columns were used for sand. (Knapp-USGS)
W70-08222

HYDRAULIC CONDUCTIVITY OF AN ISOTROPICALLY COMPRESSED SOIL,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition; Geological Survey, Menlo Park, Calif; and Oregon State Univ., Corvallis.
L. J. Waldron, J. L. McMurdie, and J. A. Vomocil.
Soil Science Society of America Proceeding, Vol 34, No 3, p 393-396, May-June 1970. 4 p, 4 fig, 10 ref.

Descriptors: *Hydraulic conductivity, *Soil compaction, *Stress, *Soil physics, Electrolytes, Soil water movement, Laboratory tests, Porosity.
Identifiers: Confining pressure (Soils).

Hydraulic conductivities (K) of disturbed samples of Yolo loam were measured under isotropic confining pressures of from 0.1 to 3.2 kgm/sq cm in a triaxial test cell. Solutions of 1,10, and 100 meq/liter of NaCl or calcium chloride produced marked differences in K, slight effects on compressibility, and no effect on soil dispersibility. The Kozeny-Carman equation showed the same pattern of failure reported for clays and soils compressed anisotropically, in that K declined much more with decreasing porosity than predicted. Hypothetical K versus depth profiles calculated from K versus confining pressure data support a hypothesis that the K decreases with depth reported in texturally homogeneous soils may be attributable to overburden pressure. (Knapp-USGS)
W70-08223

WATER RELATIONS OF A PROFILE-MODIFIED SLOWLY PERMEABLE SOIL,
Agricultural Research Service, Bushland, Tex. Southwestern Great Plains Research Center.
For primary bibliographic entry see Field 04B.
W70-08224

SOIL MOISTURE TENSION TRANSIENTS ASSOCIATED WITH EVAPOTRANSPIRATION FROM A WATER TABLE,
Agricultural Research Service, Fresno, Calif. Field Station.
For primary bibliographic entry see Field 02D.
W70-08225

WATER PERMEABILITY OF FROZEN SOILS IN THE CENTRAL CHERNOZEM PROVINCE,
G. B. Nazarov.
Transl from (Izvestiya VGO), Vol 101, No 3, p 218-224, 1969. Soviet Hydrology: Selected Papers, Issue No 1, p 79-84, 1969. 6 p, 4 fig, 6 tab, 3 ref.

Descriptors: *Permeability, *Chernozems, *Frozen ground, *Cultivation, Frost, Infiltration, Soil water movement, Lysimeters, Cultivated lands, Grasslands, Forests, Land management, Runoff.
Identifiers: USSR.

The water permeability of frozen soils was studied for 3 years on the runoff plots of the Kursk Forest-Steppe Station of the USSR. The regional soils investigated are thick clay loam chernozems. The experiments were made by the method of flooded rings which were driven into the soil to a depth of 10-15 cm. Water absorption is fairly uniform under stubble, under winter crops, and on virgin land in various parts of the same field both in thawed and frozen soils. Under natural vegetation absorption and filtration depend little on the depth of the thawed soil layer because soil under natural vegetation is more porous as a result of the prolonged effect of root systems and burrowing animals. In fields, the soil is loosened annually during fall plowing and harrowing, but it is compacted by agricultural machines during sowing and harvesting. At the depth of the plow sole (20-25 cm) the soil is compacted by plowshares. Furthermore, at the surface of the plow sole, a large amount of silt and clay is washed in from the overlying loosened soil horizons. Rains also have a considerable compacting effect on plowed fields. Under natural vegetation the soil is protected from the impact of rain drops by the plant mat and in the forest by the litter. (Knapp-USGS)
W70-08272

COMPUTATION OF THE DESALINIZATION OF SALINE SOILS UNDERLAIN BY A WATER-PERMEABLE LAYER,
R. V. Savel'yeva, and V. A. Baron.
Transl from Izvestiya Akad nauk Uzb SSR, ser. tekh nauk No 3, p 39-43, 1969. Soviet Hydrology: Selected Papers, Issue No 1, p 94-98, 1969. 5 p, 1 fig, 7 ref.

Descriptors: *Saline soils, *Leaching, *Land management, Diffusion, Ion transport, Mass transfer, Groundwater movement, Soil water movement, Permeability, Heat transfer, Convection, Salinity, Water quality, Soil chemical properties.
Identifiers: *Soil desalination, USSR.

The salt regime of soil water forms under the effect of molecular diffusion, sorption, filtration, and thermal and pressure diffusion. The gradients of thermal and pressure diffusion are 4-5 orders of magnitude lower than the gradients of the concentration of matter. Knowing the initial salinization

profile, the leaching rate (magnitude of filtration flow), porosity, the coefficient of convective diffusion, the thickness of the fine-earth mantle, and salt concentration of the leaching water, the salt regime of soils may be calculated. (Knapp-USGS)
W70-08274

RELATIONSHIPS BETWEEN CERTAIN INDICES OF SALINE WATER IRRIGATED SOILS OF WESTERN RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India); and Indian Grassland and Fodder Research Inst., Jhansi (India). Div. of Soil Science and Agronomy.
I. C. Gupta, R. K. Bohra, and C. T. Abichandani.
Annals of Arid Zone, Vol 8, No 1, p 27-32, March 1969. 5 tab, 7 ref.

Descriptors: *Saline soils, *Conductivity, *Sodium, *Cations, *Anions, Soil properties, Arid lands, Salts, Soil chemical properties, Soil texture, Alkalinity, Irrigation effects, Soil science, Correlation analysis, Regression analysis.
Identifiers: *India, *Rajasthan desert, *Saturation percentage.

In efforts to appraise soil salinity problems for reclamation efforts, it is important to know the values of electrical conductivity of saturation extracts, EC (e), total soluble cations (TCC.) and soluble Na concentration (SSC). Analytical procedures for obtaining these values are time-consuming, and inter-relationships between the various parameters vary considerably with locale. Fifty-six soil samples of varying saline and sodic conditions were collected in plots irrigated with saline water from different areas of western Rajasthan. The conductivities of 1:2 soil-water suspension, EC (2), were measured with and without known saturation percentage (SP). Analytical procedures allowing determination of EC (e), SSC, and TTC were also performed. Simple correlation coefficients were calculated between EC (2) and EC (e), TTC, and SSC, and also multiple correlation coefficients between EC (2) and EC (e) and SP, TTC and SP, and SSC and SP. Corresponding simple linear and multiple regression equations were then determined. It was concluded that EC (2) is a highly accurate predictor of the crucial parameters of EC (e), TTC, and SSC, and inclusion of known SP improves it predictability. (Casey-Arizona)
W70-08347

IMPORTANT PHYSICAL PROPERTIES OF PEAT MATERIALS,
Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station.
D. H. Boelter.
Proceedings Third International Peat Congress, Quebec, Canada, 1968, p 150-154.

Descriptors: *Peat, *Organic soils, *Water storage, *Soil density, *Soil water, *Hydraulic conductivity, *Soil physical properties, Bogs, Minnesota, Soil mositure, Soil water movement, Hydrologic properties, Retention, Porosity.
Identifiers: *Fiber content, Degree of decomposition, *Histosols, Water yield coefficient, *Bulk density.

Peat materials from 12 bogs in northern Minnesota, U.S.A., showed significant differences in physical properties. It is pointed out that (a) these properties can be related to the hydrology of organic soils only if the soils represent undisturbed field conditions, and (b) volumetric expressions of water content are necessary to correctly evaluate the amount of water in a peat profile. The differences in physical properties were related to degree of decomposition as measured by bulk density and fibre content. Undecomposed peats with low bulk density and high fibre content contain many large pores which yield as much as 80 percent of their saturated water content to drainage and permit rapid water movement. With increasing decomposition, fibre content decreases, resulting in increased bulk density and a greater proportion of small pores. The most decomposed peats yield less than 10 percent of their water to drainage and have very slow water movement rates.
W70-08424

THE HYDROLOGY OF SEVERAL PEAT DEPOSITS IN NORTHERN MINNESOTA, U.S.A.,
Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station.
R. R. Bay.
Proceedings Third International Peat Congress, Quebec, Canada, 1968, p 212-218.

Descriptors: *Peat, *Organic soils, *Bogs, *Runoff, Minnesota, Swamps, Groundwater, Water table, Streamflow, Small watersheds, Forestry.
Identifiers: *Peatlands, *Wetland hydrology, *Experimental watersheds, Bog watersheds.

A comprehensive peatland hydrology study has provided data on the climate, hydrogeology, water table levels, and run-off from forested peat deposits in northern Minnesota. Groundwater studies identified two types of hydrogeologic situations--perched bogs, independent of the underground flow system, and groundwater bogs, which were influenced by storage changes in the surrounding groundwater basin. Bog water table levels indicated storage opportunity in the peat deposit, and their reaction to precipitation was influenced in part by the type of peat material in the zone of active fluctuation. Bog run-off was not evenly distributed. Most of the annual water yield occurred in spring before June 1, while summer and fall water yields were generally low. Run-off was directly related to water table elevation in the peat deposits.
W70-08425

SOIL WATER USE FROM AN APPLE ORCHARD UNDER VARIOUS SOIL MANAGEMENT SYSTEMS,
Department of Agriculture, Ferntree Gully, (Victoria). Scores by Horticultural Research Station.
For primary bibliographic entry see Field 03F.
W70-08428

DISTORTION TESTS ON DRAINED NATURAL CLAY SAMPLES,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
J. D. Nieuwenhuis.
LGM Mededelingen, Delft Laboratoriumvoor Grondmechanica) Deel 13, No 4, p 147-184, April 1970. 38 p, 22 fig, 3 ref, 3 append.

Descriptors: *Clays, *Soil physical properties, *Deformation, Soil mechanics, Compressive strength, Consolidation, Soil compaction, Soil strength, Laboratory tests, Hysteresis, Stress analysis, Strength of materials, Shear strength, Tensile strength, Testing.
Identifiers: Clay mechanical properties.

Results obtained from distortion tests on natural clay samples are presented. The traditional cell test is compared with compression-distortion tests. The few modifications of the cell apparatus necessary to allow the execution of compression-distortion tests are described. A program of tests was designed to investigate the properties of the shear modulus G of drained samples. The samples were subjected to variations in isotropic stress, deviator stress and deviator stress rate. G appeared to be variable, but its reproduction is satisfactory. The influence of isotropic stresss is very small. G is largely determined by the deviator stresses. The hysteresis loop changes if larger maximum deviator stresses are applied. Time effects are reflected in the shear modulus, since clay soils creep (continued deformation under constant load). An empirical estimate of time effects is presented. (Knapp-USGS)
W70-08481

PRELIMINARY ANALYSIS OF RATE OF MOVEMENT OF STORM RUNOFF THROUGH

THE ZONE OF AERATION BENEATH [illegible] RECHARGE BASIN ON LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 02F.
W70-08486

SOIL MICROBIAL ECOLOGY OF VALLEY OF 10,000 SMOKES, ALASKA,
Jet Propulsion Lab., Pasadena, Calif.
Roy E. Cameron.
Journal of the Arizona Academy of Science, Vol [illegible] No 1, p 11-40, March 1970. 14 fig, 15 tab, 76 ref.

Descriptors: *Alaska, *Soil microorganisms, *Soil physical properties, *Soil chemical properties, *Soil water, Soil texture, Soil types, Soil algae, Soil bacteria, Soil erosion, Soil stability, Soil water movement, Soil temperature, Mosses, Winds, Wind erosion, Porosity, Acidic soils, Conductivity, Soil types, Bulk density, Specific gravity, Osmotic pressure, On-site investigations.
Identifiers: *Liverworts, *Extraterrestrial biology, *Harsh environments, *Water retention, Available water, Macrovegetation, Soil air, Extractable ions, Reflectivity ratios.

Surveys of soil microflora are conducted in various harsh environments such as deserts in an effort to gather experience for similar investigations in extraterrestrial environments. The Valley of the 10,000 Smokes in Alaska's Katmai Peninsula is a harsh environment, and a desert in the sense that sparse support for animal and plant life, but water is not a limiting factor. The area is characterized by high annual rainfall, low annual mean temperature, few sunny days, a soil derived from volcanic eruptions in 1912, soil-eroding winds, and a large number of dying fumaroles. Studies were conducted involving physical and physicochemical soil properties and determinations of soil microflora. Algae, mosses, and liverworts present 40 years ago have died out with the dying fumaroles and cannot become established in other areas due to the sandblasting of the high winds. Soil porosity is high, causing rapid drainage and runoff. The soil microflora were limited by a number of soil factors: (1) Low available water (2) Sparse macrovegetation (3) Low clay composition (4) High specific gravity and low bulk density resulting in high erodability (5) A pH-Eh millieu maintaining acidic, reduced and anaerobic conditions (6) Low electrical conductivity and related osmotic pressure values (7) Low percentages of extractable ions (8) Possible Al toxicity (9) Low C, H, and N percentages (10) Generally low wet/dry reflectivity ratios. (Casey-Arizona)
W70-08535

2H. Lakes

PLANKTON COMMUNITY AND HYDRAULIC CHARACTERIZATION PRELIMINARY TO LAKE FLUSHING,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05C.
W70-08166

PALYNOLOGICAL TRACING OF SALINE WATER SOURCES IN LAKE KINNERET REGION (ISRAEL),
Hebrew Univ., Jerusalem (Israel). Dept. of Geology.
A. Horowitz.
Journal of Hydrology, Vol 10, No 2, p 177-184, Feb 1970. 8 p, 1 fig, 2 tab, 17 ref.

Descriptors: *Saline water systems, *Springs, *Lakes, *Tracking techniques, *Palynology, Brines, Discharge (Water), Groundwater movement, Tracers, Water chemistry, Water quality, Mixing, Water sources, Provenance.
Identifiers: Lake Kinneret (Israel).

lynological spectra of water samples represent- g four groups of saline sources are compared with freshwater spectrum in Lake Kinneret region. he palynological spectra indicate that the saline aters are a mixture of recent water with active uifers from an intake area in the mountains west the lake that dilute in various proportions con- ntrated saline solutions of Upper Pliocene to wer Pleistocene age. (Knapp-USGS)
70-08209

EMPERATURE MICROSTRUCTURE IN A RESH WATER THERMOCLINE,
arine Sciences Lab., Menai Bridge (Wales); and itish Meteorological Office, Bracknell (En- and).
H. Simpson, and J. D. Woods.
ature, Vol 226, p 832-834, May 30, 1970. 3 p, 4 g, 2 ref.

escriptors: *Surface waters, *Lakes, *Water tem- erature, *Fresh water, *Thermocline, Velocity, hermal stratification, Stratification, Density ratification.
dentifiers: *Temperature microstructure, *Loch ess.

ecent measurements of microstructure in the cean show a steplike distribution of temperature, alinity and velocity. One school of thought ex- lains the microstructure in terms of interleaving of ayers originating at different locations, while nother suggests that vertical diffusion of heat, salt nd momentum may inevitably result in the evelopment of layers. Observations in Lake Bala n Merionethshire and of the thermocline of Loch ess, a Scottish freshwater lake about 30 km long nd 1 km wide and with an average depth of nearly 00 m both showed microstructure. The vertical cale of the thermocline microstructure found in Loch Ness is indistinguishable from that found in he Mediterranean thermocline and in weakly tratified water in the Pacific Ocean. Temperature nicrostructure in a freshwater lake demonstrates hat salinity gradients are not an essential factor in he generation of ocean microstructure. (Woodard-USGS)
W70-08251

HEAT TRANSFER COEFFICIENT IN WATER BODIES WITH LIMITED FLOWAGE DURING SUMMER HEATING,
For primary bibliographic entry see Field 02C.
W70-08269

WATER QUALITY BEHAVIOR IN RESERVOIRS,
Consumer Protection and Environmental Health Service, Cincinnati, Ohio.
For primary bibliographic entry see Field 05C.
W70-08278

LIMNOLOGICAL CONDITIONS IN VOLTA LAKE, THE GREATEST MAN-MADE LAKE OF AFRICA,
Ghana Academy of Sciences, Accra. Inst. of Aquatic Biology.
B. Entz.
Nature and Resources, Vol 5, No 4, p 9-16, Dec 1969. 8 p, 3 fig, 1 tab.

Descriptors: *Limnology, *Lakes, Lake fisheries, Lake breezes, Aquatic life, Water quality, *Dissolved oxygen, Aquatic plants, Floating plants, Oligotrophy, *Aquatic weeds, Water chemistry, Water analysis, Hydrology, Dissolved solids, Thermocline, Turbidity, Rainfalll, *Reservoirs, Foreign projects, Reservoir fisheries, Hypolimnion.
Identifiers: *Lake Volta, Ghana, Floating weeds, Africa, Ghana.

The limnological conditions in Volta Lake were studied for fishery and other applied scientific purposes, and to gather fundamental data on this newly formed tropical lake. Results are summarized on the present state of the lake, effect of certain factors affecting its condition, major conditions occurring since formation of the lake, and some indications of further changes in the near future. The oxygen content was very low in the first 3 yr and well-oxygenated zones were restricted to the uppermost 5 to 10 m strata. Dissolved oxygen increased considerably in the next several years and seasonal fluctuations appeared. The increase in dissolved oxygen appears to be caused by wind activity and a decrease in oxygen consumption from the decomposition of organic material. Floating plants are very abundant in certain sections of the lake, sometimes forming dense mats; under the mats, the water is almost devoid of oxygen and is without fish and other higher aquatic life. The plants are also hosts for snails which are vector organisms for human diseases. Manmade lakes in northern countries should reach stabilized limnological conditions in 20 to 25 yr. In the tropics, changes occur more rapidly and stabilized conditions may be achieved in Lake Volta within 5 to 10 yr. (USBR)
W70-08445

NEARSHORE UNDER ICE WATER MOVEMENT AT NANTICOKE, LAKE ERIE - 1970,
Ontario Water Resources Commission, Toronto. Great Lakes Water Quality Surveys Program.
M. D. Palmer, and J. B. Izatt.
Ontario Water Resources Commission Report, Great Lakes Water Quality Surveys Program, May 1970. 22 p, 5 fig, 6 tab, 2 ref, 3 append.

Descriptors: *Currents (Water), *Lake Erie, *Iced lakes, Lake ice, Measurement, Current meters, Dispersion, Path of pollutants, Water quality control.
Identifiers: Nanticoke (Ontario).

Currents were measured at Nanticoke, Lake Erie, with a recording current meter from December 1969 to March 1970, when an ice cover existed in the area. The currents were measured at a fixed point 700 m from the shore at a point 3 m from the bottom in 11 m of water. The water movements were generally in the same direction as those without an ice cover; however, longer periods of little or no water movement existed. Periods of velocity jetting occurred after the ice cover formed. The mean monthly and hourly dispersion characteristics with an ice cover were significantly less than without an ice cover, particularly in February, indicating the need to avoid waste discharges in the adjacent nearshore areas. (Knapp-USGS)
W70-08479

STRATIFIED RESERVOIR CURRENTS, PARTS 1 AND 2,
Oregon State Univ., Corvallis. Engineering Experiment Station.
Larry S. Slotta, E. Harvey Elwin, Howard T. Mercier, and Michael D. Terry.
Available from the Clearinghouse as PB-188 356, $3.00 in paper copy, $0.65 in microfiche. Oregon State University Engineering Experiment Station Bulletin No 44, October 1969. 158 p, 46 fig, 43 ref. FWQA Project 16080 DRX---10/69.

Descriptors: *Stratification, *Reservoirs, *Water quality, *Mathematical models, *Stratified flow, Currents (Water), Density stratification, Density currents, Model studies, Hydraulic models, Mixing, Flow, Open channel flow, Hydrodynamics, Hydraulics, Simulation analysis, Fluid mechanics.
Identifiers: Stratified reservoirs.

This volume contains two papers devoted to stratified currents research at Oregon State University under the sponsorship of the United States Department of the Interior, Federal Water Pollution Control Adminstration. The general purpose of the work was the investigation of the internal currents created by withdrawal from reservoirs stratified by surface heating. Special attention was given to the effects of entering streamflow and withdrawal on currents. Time-lapse photographic techniques for recording flows through a density stratified impoundment model permits viewing a lengthy experiment (1-1/2 hours) in a few minutes in movie form. Specific studies on geometrical effects of boundaries on internal currents have been conducted. Graphic displays of time development of internal stratified flows have been simulated using digital computers. (See also W70-08502 and W70-08503) (Knapp-USGS)
W70-08501

THREE STATISTICAL PROGRAMS TO PROCESS LIMNOLOGICAL DATA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
H. E. Sweers.
Canada Department of Energy, Mines and Resources, Marine Sciences Branch Manuscript Report Series, No 13, 1970. 55 p, 3 fig, 7 ref, 5 append.

Descriptors: *Computer programs, *Statistical methods, *Data processing, *Limnology, Hydrologic data, Statistics, Water temperature, Thermocline, Epilimnion, Hypolimnion, Mixing, Data collections.
Identifiers: Limnological data.

Three programs, written in Fortran IV for a CDC 3100 computer, were designed to calculate means, standard deviations, standard errors and other statistics of various limnological parameters. STATISTICS I gives weighted cruise-mean values, cruise-mean epilimnion and hypolimnion values, tabulations of the relation between temperature and other parameters, and near-bottom means. STATISTICS II is especially designed to study regional anomalies in the distribution of any parameter. STATISTICS III is a more specialized program analyzing the variability in a set of data in terms of random and systematic components. (Knapp-USGS)
W70-08508

PRODUCTION RATE OF THE PERIPHYTON IN LAKE TIBERIAS AS MEASURED BY THE GLASS SLIDE METHOD,
Hebrew Univ., Jerusalem. Dept. of Botany.
Inka Dor.
Israel Journal of Botany, Vol 19, No 1, p 1-15, 1970. 3 fig, 6 tab, 21 ref.

Descriptors: *Periphyton, *Algae, *Primary productivity, *Lakes, Biomass.
Identifiers: *Israel, *Lake Tiberias, Photophilic animals, Mediterranean climates.

The periphyton of Lake Tiberias are mainly Diatomeae who cling to the basaltic rocks and stones along the shore. Glass slides arranged vertically in wooden frames were submerged for 26-35 days and analyzed for biomass. Net production rate (NPR) values fluctuated sharply with time, rising steeply in the spring, peaking for a short duration, then dropping to low summer levels followed by a smaller autumn peak. All dominant species were represented in the spring peak. The seasonal fluctuations had a coefficient of variation of 15.5 percent in the spring and 7.5% in the autumn, and were characteristic of biological activity in subtropical Mediterranean climates. NPR values decreased with depth, indicating extremely photophilic populations. A shore strip of 14 square kilometers had an estimated production potential of 1533 tons of organic matter per year. Although the actual productivity of the strip could not be exactly measured, indirect methods indicated it was 42.5 percent of potential productivity, or 650 tons of net organic matter per year. (See also W70-08534) (Casey-Arizona)
W70-08533

EVAPORATION FROM LAKE TIBERIAS: AN ESTIMATE BY THE COMBINED WATER BALANCE-MASS TRANSFER APPROACH,
National and Univ. Inst. of Agriculture, Rehovoth (Israel). Volcani Inst. of Agriculture Research.

G. Stanhill.
Israel Journal of Earth-Sciences, Vol 18, p 101-108, 1969. 4 fig, 1 tab, 11 ref.

Descriptors: *Lakes, *Evaporation, *Seepage, *Mass transfer, *Water balance, Vapor pressure.
Identifiers: *Israel, *Lake Tiberias, Wind run.

Ten years of hydrological and meterological records from Lake Tiberias, insufficient in themselves, were combined to yield an estimation of evaporative loss. The sum of evaporation (E) and net seepage flow (S) were poltted against the mass transfer coefficient (N). The value of E + S was determined by a water balance equation utilizing values for inflow, outflow, rainfall and monthly charges in water level. S is not constant throughout the year, but linear curves may be obtained only with data from constant periods. In January, February and March, net inflow is greater than evaporative loss. Two separate linear relationships could be fitted to the data if those months were excluded. The slopes of the 2 curves were identical and the estimate of 1844 mm annual evaporation agreed within 10 percent of previous estimates. Deficiencies in the climatic and hydrological data and possible errors due to theoretical oversimplification are discussed. (See also W70-08533) (Casey-Arizona)
W70-08534

THE TEMPERATURE OF LAKE TIBERIAS,
National and Univ. Inst. of Agriculture, Rehovoth (Israel). Volcani Inst. of Agriculture Research.
G. Stanhill.
Israel Journal of Earth-Sciences, Vol 18, p 83-100, 1969. 10 fig, 3 tab, 10 ref.

Descriptors: *Lakes, *Water temperature, *Thermal properties, Isotherms, Diurnal distribution, On-site investigations.
Identifiers: *Israel, *Lake Tiberias, Areal variation, Heat storage, Surface temperature.

Water temperature measurements on the surface and at various depths at 15 stations on Lake Tiberias were replicated over a period of 2 years. Annual temperature ranges were 16.6 and 19.6 degrees centigrade, equivalent to heat storage changes of 40,000 and 47,240 calories per square centimeter per year. These figures were less than those found in previous years, possibly because of recent drainage project in the area. Areal variations are less than 2 degrees at the surface and increase with depth at shallow levels. Diurnal variations were greatest in surface waters decreased with depth, rarely exceeded 2.5 degrees, and were greatest in summer. Although considerable annual differences in the thermal regime of the lake were found, there is as yet insufficient data for conclusions concerning long term trends.
W70-08537

2I. Water in Plants

WATER BALANCE OF SOME WARM DESERT PLANTS IN A WET YEAR,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 02D.
W70-08175

HYDROGEN ISOTOPIC FRACTIONATION OF WATER PASSING THROUGH TREES,
Geological Survey, Denver, Colo.; and Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 02K.
W70-08186

EVAPOTRANSPIRATION MEASUREMENT BY CHLORIDE TRANSLOCATION,
Agricultural Research Service, Reno, Nev. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02D.
W70-08210

INFLUENCE OF IRRIGATION INTERVAL AND PLANT DENSITY OF ALFALFA SEED PRODUCTION,
American Univ., Beirut (Lebanon). Faculty of Agricultural Sciences.
For primary bibliographic entry see Field 03F.
W70-08341

MOISTURE AND TEMPERATURE EFFECTS ON EMERGENCE AND INITIAL GROWTH OF TWO RANGE GRASSES,
Agricultural Research Service. Crops Research Div.; and New Mexico Agricultural Experiment Station, University Park.
Carlton H. Herbel, and Ronald E. Sosebee.
Agronomy Journal, Vol 61, No 4, p 628-631, July-August 1969. 9 tab, 6 ref.

Descriptors: *Gamma grasses, *Plant growth, *Soil temperature, *Soil moisture, *Arid lands, Range grasses, Forage grasses, Desert plants, Southwest U. S., Semiarid climates, Moisture tension, Moisture stress, Field capacity, Limiting factors, Evaporation.
Identifiers: *Boer lovegrass, *Survival, *Seedlings, *Emergence, *Desert grasslands.

Researchers studied the effects of two temperature regimes and five moisture levels on early growth of boer lovegrass (Eragrostis chloromelas Steud.) and black grama (Bouteloua eriopoda (Torr.) Torr.). Depending on the moisture level, daily maximum soil temperatures ranged from 38 to 51 deg C (low temperature regime) and from 53 to 67 deg C (high temperature regime). Of the five soil moisture levels, level A was approximately at field capacity. Levels B and C were watered as level A on the planting day, then reduced to about one-half and one-third, respectively, of level A for the duration of the trial. Levels D and E were watered as level A for the first three days, then reduced in the same manner as levels B and C. In the 21-day experiment it took 231 mm of water for either species to survive in the high temperature regime, but only 70 mm of water to survive in the low one. Soil moisture reduction a day after planting decreased seedling survival more than moisture reduction on the third day after planting. Neither grass emerged at moisture levels B and C in the high temperature regime. Survival of these species in the Southwest would be enhanced by lower soil temperatures and less evaporation from the soil surface. (Carr-Arizona)
W70-08342

IRRIGATED WHEAT ON A CALCAREOUS SOIL AS AFFECTED BY APPLICATION OF NITROGEN, PHOSPHORUS, POTASSIUM, AND ZINC: I. YIELD, COMPOSITION, AND NUMBER OF HEADS,
American Univ., Beirut (Lebanon). Faculty of Agricultural Sciences.
For primary bibliographic entry see Field 03F.
W70-08343

REPRODUCTION BIOLOGY OF THE INDIAN DESERT HARE, LEPUS NIGRICOLLIS DAYANUS BLANFORD,
Central Arid Zone Research Inst., Jodhpur (India). Div. of Animal Studies.
I. Prakash, and G. C. Taneja.
Mammalia, Vol 33, No 1, p 102-117, March 1969. 3 fig, 8 tab, 23 ref.

Descriptors: *Xerophilic animals, *Mammals, *Monsoons, *Reproduction, *Impact (Rainfall), Physiological ecology, Arid lands, Animal behavior, Precipitation (Atmospheric), Wet seasons.
Identifiers: *India, *Rajasthan desert, *Desert hare, *Animal-plant relationships, Rabbits, Annual productivity.

Desert hares were shot and collected every month, for a year, in the Jodhpur region of the Rajasthan desert. The testes were weighed and epididymal smears were taken on male specimens. The numbers of pregnant and lactating females were d
mined and the corpora lutea and embryos
counted. From these figures, blastocyst trans
embryonic mortality and annual productivity
female could be estimated. The numbe
pregnant females and the number of embryos
pregnant female were highest during the mons
season of July-September when daylength
green forage availability were optimal. The te
weights fluctuated in parallel with the pregnan
the right testes being significantly heavier than
left. Although breeding activity in different a
could be directly correlated with local forage qu
ty, it was felt that the increase in prevalenc
pregnancy during the April-June hot, dry mo
indicated other reproduction limiting factors in
dition to green forage. The annual production
young per female was estimated to be 10.66. It
concluded that seasonal breeding of the In
hare is in general conformity with seasonal bre
ing in species of this genus from all over the wo
(Casey-Arizona)
W70-08345

SEASONAL CHANGES IN BODY FLUIDS IN FIELD POPULATION OF SPADEFOOT TOAD
Southwestern Research Station, Portal, Ariz.; California Univ., Dept. of Life Sciences.
V. H. Shoemaker, L. McClanahan, Jr., and R. Ruibal.
Copeia, No 3, p 585-591, August 1969. 4 fig, 1 t 12 ref.

Descriptors: *Toads, *Arizona, *Amphibia *Animal physiology, *Osmotic pressure, Moist stress, Electrolytes, Ureas, Urine, Moisture stre Moisture uptake, Arid lands, On-site investigatio Animal metabolism, Soil moisture.
Identifiers: *Anurans, *Spadefoot toads, Plass Bladder water, Total solute concentrations.

Many anuran amphibian species in arid regio burrow during the dry seasons and emerge dur the wet seasons. In an effort to determine bo fluid balances in these animals, individuals of 2 sp cies of spadefoot toads (Scaphiopus hammon and Scaphiopus couchii) in southeastern Arizo were unearthed at 3 different times of the year: (September - shortly after burrowing (2) Marc about the middle of the dry season (3) June shortly before emerging. Electrolytes, urea, to solute concentrations in urine and plasma, a bladder urine volume were measured. These we correlated with soil moisture tension. In Septemb and March bladder urine volume and solute co centrations in urine and plasma were equivalent their levels in fully hydrated animals. In June, plasma solute levels and urinary urea levels we higher and soil moisture content was lower. Th was interpreted as resulting from changes in s moisture tension during the advance of the d season. In September and March the toads we presumably capable of passive water uptake fro the soil, but by June soil water potential ha decreased enough to raise total solute concentr tions through the effects of net water loss an metabolic urea production. (Casey-Arizona)
W70-08348

THE ROLE OF THE SEXUAL STAGE IN TH OVER-SUMMERING OF ERYSIPHE GRAMIN DC. F. SP. HORDEI MARCHAL UNDER SEM ARID CONDITIONS,
Technion - Israel Inst. of Tech., Haifa; and Hebre Univ., Jerusalem (Israel).
K. Koltin, and R. Kenneth.
Annals of Applied Biology, No 2, Vol 65, p 26 268, April 1970. 3 tab, 11 ref.

Descriptors: *Plant diseases, *Pathogenic fung *Barley, Parasitism, Arid lands, Grasses, Pla pathology, Growth stages, Water balance, Rainfa Impact (Rainfall), Leaves, Wet seasons.
Identifiers: *Israel, *Cleistothecia, *Ascospore Mycelia, Fruiting bodies, Powdery mildew disea Ascospore differentiation.

owdery mildew disease in barley is caused by the ungal parasite Erysiphe graminis f.sp. hordei. Stuies were initiated to determine the role of the sexal stage of the fungus in the epidemiology of this isease in the arid areas of Israel, where the barley rowing season and the major rainfall occur from id-October to mid-May, followed by 5-6 rainless onths. All 135 sown barley varieties were atacked by the fungus in at least one nursery, with he appearance of cleistothecia. No ascospores ere found during the growing season or summer. leistothecia collected on dry leaves from May ntil first rains, were kept in constant moisture and lmost always produced ascospores within 72 ours, but those collected during the rainy season ook up to 264 hours for ascospore differentiation nder the same conditions. Ascospore differentiaion cannot be induced during early or late spring ains, but it does occur during the first autumn ains and this can be correlated with seed induction n the barley. In Israel, therefore, a sexual stage is roduced in early spring which tides the fungus ver the summer and produces inoculum for newly merging host in the fall. (Casey-Arizona)
W70-08349

SUMMER FALLOW FOR DRYLAND WINTER WHEAT IN THE SEMIARID GREAT PLAINS,
Agricultural Research Service. Northern Plains Branch; and Nebraska Univ., North Platte. Agricultural Experiment Station.
For primary bibliographic entry see Field 03F.
W70-08350

BODY FLUID PARTITIONING IN REPTILIA,
Nebraska Univ., Lincoln. Dept. of Zoology.
Thomas B. Thorson.
Copeia, No 3, p 592-601, June 3, 1969.

Descriptors: *Reptiles, *Water balance, *Animal metabolism, Physiological ecology, Animal physiology.
Identifiers: *Body fluids, *Fluid compartments, *Body water content, Extracellular water, Intracellular water, Blood volume, Plasma volume.

By injection of sucrose and Evans blue dye into circulatory systems, the relative amounts of ody fluid in the major fluid compartments of reptiles were determined. The species studied were about evenly divided between marine, terrestrial, and freshwater forms. Specific gravities and volumes of whole blood and plasma, hematocrits, and extracellular and interstitial fluid volumes were all lowest in the freshwater forms. Conversely, the freshwater forms had the greatest total body water and intracellular fluid volumes. The marine and terrestrial habitats were considered analogous from the standpoint of water economy since their fluid partitioning differed in a similar fashion from the freshwater forms, although the marine patterns were somewhat more pronounced. Marine and terrestrial forms have lower body water contents because dehydrating stress is not fully compensated for, although extracellular fluid volume is kept high at the expense of protoplasmic water. It is unclear whether the fluid partitioning in the various forms is genetically determined or a response to osmotic stress. (Casey-Arizona)
W70-08354

MYCORRHIZA IN DESERT SOILS,
Northeastern Univ., Boston, Mass. Dept. of Biology.
A. K. Khudairi.
Bioscience, Vol 19, No 7, p 598-599, July 1969. 1 fig, 8 ref.

Descriptors: *Root systems, *Fungi, *Nitrogen fixing bacteria, *Soil-water-plant relationships, Lichens, ARID LANDS, Xerophytes.
Identifiers: *Iraq, *Mesopotamian desert, *Mycorrhizas, Mycelia, Nutrient cycling.

Mycorrhizas are fungal symbionts associated with many species of cultivated plants and small native desert shrubs in the Mesopotamian desert. Another symbiont in the native shrubs in the nitrogen fixing bacteria, Rhizobium, in the root nodules. When leaves fall in the autumn, nitrogen is added to the soil and its absorption is facilitated by the mycorrhizas. Phosphorus and potassium are also rare in desert soils and their uptake is enhanced by the mycorrhizas. Despite the low soil organic matter, many other fungi such as truffles occur in desert soils. They, together with lichens, mycorrhizas, and soil and root bacteria, form a complex and efficient nutrient recycling system in desert soils. (Casey-Arizona)
W70-08355

STUDIES IN WATER RELATIONS OF RICE,
Calcutta Univ. (India).
P. K. Sen, and D. K. Das Gupta.
The Indian Journal of Agricultural Sciences, Vol 39, No 10, October, 1969, p. 1000-1009. 4 tab, 3 fig, 10 ref.

Descriptors: *Water requirements, Water levels, *Irrigation effects, Fertilizers, *Rice, Nitrates, Fertilizers, *Plant growth.
Identifiers: Chinsurah, West Bengal, India, Ammonium sulphate, Rice varieties, (CB1, Dhairal, Bhasamanik, Dular).

This paper measured the effects of season, water quantity and nitrogen levels on yields of rice in India. Based on experimentation with three varieties of rice, the authors concluded that there is a 'mutual interdependence' between water and nitrogen levels. Under high water levels they found a moderate amount of nitrogen (e.g. 45 kilograms per hectare) produced optimum yields; and with moderate water levels a higher amount of nitrogen was necessary. Also reported was preference for the growing season of November to April. (Holmes-Rutgers)
W70-08358

PEANUT RESPONSE TO UNIFORM AND NON-UNIFORM SOIL SALINITY,
National and Univ. Inst. of Agriculture, Rehovoth (Israel). Volcani Inst. of Agriculture Research.
For primary bibliographic entry see Field 03C.
W70-08521

FOOD AND WATER REQUIREMENTS OF DORCAS GAZELLE IN THE SUDAN,
Khartoum Univ. (Sudan). Dept. of Zoology.
D. B. Carlisle, and L. I. Ghorbial.
Mammalia, Vol 32, No 4, p 570-576, December, 1968. 2 fig, 1 tab, 5 ref.

Descriptors: *Xerophilic animals, *Mammals, *Ruminants, *Food habits, *Leaves, Water conservation, Legumes, Arid lands, Deserts, Droughts, Xerophytes, Moisture availability, Animal metabolism, Drought tolerance, Physiological ecology, Nutrient contents, Water balance.
Identifiers: *Sudan, *Gazelles, *Acacias, *Animal-plant relationships, Leaf moisture content, Crepuscular animals.

Dorcas gazelles, Gazella dorcas dorcas (Linne), were observed in a number of localities in northern Sudan during a 6 month dry period when no green grass was evident. They were essentially crepuscular and fed only on Acacia tortilis, never dry grass or any other green shrub. Acacia tortilis is an arid zone bush which retains its leaves for about 18 months after the last rain. Leaves were analyzed for moisture and nutrient contents as a function of time since the last rainfall. Leaves from areas with a span of 10-40 weeks since last rainfall had a mean moisture content of 6 percent which was not correlated with time within that span. A sample from an area of 80 weeks since last rainfall showed a drop in mean moisture content to 48.6 percent with mean protein, carbohydrate, fibre, ash and calorific contents increasing from 20-45 percent over the 10-40 week samples. The calorific and water requirements of captive gazelles feeding on sorghum were measured. This data was then used to estimate weights of Acacia leaves necessary for consumption in satisfying those requirements. It was concluded the Dorcas gazelle, unlike a close relative, Thompson's gazelle, may survive dry periods without drinking by eating only Acacia leaves, and need move out of a drought-stricken region only after the leaves have fallen. (Casey-Arizona)
W70-08529

AFTER-EFFECT OF WATER STRESS ON STOMATAL OPENING POTENTIAL I. TECHNIQUES AND MAGNITUDES,
California Univ., Davis. Lab. of Plant-Water Relations.
R. A. Fischer, Theodore C. Hsiao, and Robert M. Hagan.
Journal of Experimental Botany, Vol 21, No 67, p 371-385, May 1970. 7 fig, 4 tab, 21 ref. OWRR Project B-029-CAL.

Descriptors: *Stomata, *Moisture deficit, *Leaves, *Turgidity, Tobacco, Beans, Plant physiology, Moisture uptake, Moisture stress, Drought tolerance, Photoactivation, Water balance, Carbon dioxide.
Identifiers: *Leaf turgor, *Stomatal opening potential, *Leaf discs, Resistance porometer, Fick's law, Stomatal resistance.

During periods of drought, plant leaf stomata close up, thereby decreasing carbon dioxide uptake, which contribute to the general decline of the plant. Leaf discs from tobacco (Nicotiana tabaccum) and broad beans (Vicia faba) were floated on distilled water, under conditions of high relative humidity, low air turbulence, and controlled illumination and temperature, until they reached full turgor. Their stomatal aperture sizes were then estimated by use of a resistance porometer and usually also measured directly. Following a period of stress, the effects of a 30-40 percent water deficit in tobacco leaves involved a markedly lowered ability to open in light and lasted approximately 2-5 days after rewatering. Some leaves recovered to levels greater than the controls, probably due to arrested senescence during stress. Leaf production ceased abruptly during stress and recovered with rewatering. Depressions in stomatal opening potential were positively correlated with extent of deficit but recovery time was independent of duration and severity of stress. The effects of stress in beans were similar, but less pronounced than those in tobacco except that dry weight was not affected and stomatal function recoveries never exceeded control levels. The leaf disc assay technique eliminated the possibility that the measured stomatal after-effect was directly caused by persistence of small leaf-water-deficits. In an Appendix section the validity of the leaf disc assay method is examined. (See also W70-08531) (Casey-Arizona)
W70-08530

AFTER-EFFECT OF WATER STRESS ON STOMATAL OPENING II. POSSIBLE CAUSES,
California Univ., Davis. Lab. of Plant-Water Relations.
R. A. Fischer.
Journal of Experimental Botany, Vol 21, No 67, p 386-404, May 1970. 10 fig, 3 tab, 27 ref. OWRR Project B-029-CAL.

Descriptors: *Moisture stress, *Stomata, *Carbon dioxide, *Leaves, *Turgidity, Tobacco, Beans, Photosynthesis, Plant physiology, Moisture uptake, Moisture deficit, Drought tolerance, Photoactivation, Water balance, Metabolism.
Identifiers: *Guard cells, *Leaf discs, *Stomatal opening potential, Stomatal resistance, Metabolic inhibitors, Carbon dioxide compensation point.

Changes in stomatal apertures by transfers of epidermal strips of bean leaf between stressed and control mesophyll and reduction of the after effect on mean aperture in bean and tobacco leaf strips in carbon dioxide - free air indicated that about one-third of the after effect could be attributed to

changes in leaf mesophyll, probably through elevated substomatal cavity carbon dioxide levels. Although this explanation is not supported by carbon dioxide compensation point measurements, increased sensitivity of poststress discs to photosynthetic inhibitors is consistent with it, and on balance it is thought valid. Large after-effects in epidermal strips lacking mesophyll indicated guard cells were primarily responsible for two-thirds of the phenomenon. Neither carbon dioxide- free air nor metabolic inhibitors, in short term application, appreciably reduced the after-effects, and starch levels in the guard cells did not decrease during the water stress. Stomatal recovery in post-stress tobacco leaves indicated recovery required light and time. However, light was ineffective in carbon dioxide-free air and the light requirement was completely replaced by the addition of glucose-l-phosphate. Recovery may involve 2 temporally separate steps only one of which requires light and probably photosynthate. It was concluded that although guard cell activity is the major factor in the post-stress damage, the mechanisms are not understood. (See also W70-08530) (Casey-Arizona)
W70-08531

PRODUCTION RATE OF THE PERIPHYTON IN LAKE TIBERIAS AS MEASURED BY THE GLASS SLIDE METHOD,
Hebrew Univ., Jerusalem. Dept. of Botany.
For primary bibliographic entry see Field 02H.
W70-08533

SOIL MICROBIAL ECOLOGY OF VALLEY OF 10,000 SMOKES, ALASKA,
Jet Propulsion Lab., Pasadena, Calif.
For primary bibliographic entry see Field 02G.
W70-08535

EFFECT OF MOISTURE TENSION, TEMPERATURE AND LIGHT ON GERMINATION OF FOUR EXOTIC RANGE GRASSES,
Institute for Research on Natural Resources, Abu-Ghraib (Iraq).
Tariq A. Al-Ani, and Nazar A. Ouda.
Annals of Arid Zone, Vol 8, No 1, p 45-51, March 1969. 2 fig, 2 tab, 12 ref.

Descriptors: *Germination, *Xerophytes, *Range grasses, *Temperature, *Moisture stress, Arid lands, Osmotic pressure, Moisture tension, Drought tolerance, Plant growth, Light.
Identifiers: *Iraq, *Germination rate, Mannitol.

Four species of imported palatable pasture grasses, Cenchrus ciliaris, Cenchrus setigerus, Eragrostis superba and Panicum antidotale, were tested for germination capabilities in varying temperatures in dark and light, and under varying moisture stresses. In temperature studies ranging from 20-30 degrees centigrade, it was found that germination rates increased with temperature. Only E. superba showed a preference for light in final germination at higher temperatures. D-mannitol, at osmotic concentrations ranging from 1/3-15 atmopheres simulated drought conditions. In all cases, as moisture tensions increased, germination rate decreased and time to final germination increased. However, the 4 species responded differentially, and the descending order in ability to germinate under drought conditions was: C. setigerus, C. ciliaris, E. superba and P. antidotale. Seeding growth under differing moisture tensions, as measured by plumule and radicle growth, also showed differential responses. The descending order of growth ability under drought conditions was: E. superba, C. setigerus, C. ciliaris and P. antidotale. (Casey-Arizona)
W70-08536

2J. Erosion and Sedimentation

THE USE OF GRAVITY SHAFTS FOR GROUNDWATER RECHARGE - PHASE I,
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 04B.
W70-08152

A BURET CYLINDER FOR GRAIN-SIZE ANALYSIS OF SILT AND CLAY (WITH ALGOL-PROGRAM),
Technische Hochschule, Munich (West Germany). Sedimentology and Marine Geology Div.; and Bayerische Landesstelle fur Gewasserkunde, Munich (West Germany).
F. Fabricius, and St. Muller.
Sedimentology, Vol 14, No 1-2, p 39-50, April 1970. 12 p, 6 fig, 1 tab, 13 ref.

Descriptors: *Computer programs, *Analytical techniques, *Particle size, *Silts, *Clays, Sediments, Suspended load, Turbidity, Settling velocity, Sieve analysis.
Identifiers: *Particle size analysis.

A new apparatus, using a buret cylinder was constructed in order to increase the efficiency of the size analysis of fine-grained sediments. Its uncomplicated operation and automatic leveling enable working series of 10 samples or more at a time. This method, an improvement of the pipet method, works with an accuracy comparable to that of the Atterberg method. An ALGOL-program was compiled to compute all data obtained from the granulometric analysis of sediments. In the output, the numerical parameters are printed out and a simple frequency and a cumulative diagram is plotted. The computer program works for grain sizes from -6 phi to +9 phi. Two procedures can be applied alternatively: (a) sieving--buret analysis; and (b) sieving--visual accumulation tube--buret analysis. (Knapp-USGS)
W70-08169

TREATMENT OF SPHERICITY AND ROUNDNESS DATA OF QUARTZ GRAINS OF CLASTIC SEDIMENTS,
Regional Engineering Coll., Rourkela (India). Dept. of Geology.
Basanta K. Sahu, and B. C. Patro.
Sedimentology, Vol 14, No 1-2, p 51-66, April 1970. 16 p, 13 tab, 21 ref.

Descriptors: *Particle shape, *Sands, *Analytical techniques, *Sediments, Sieve analysis, Statistical methods, Quartz, Measurement.
Identifiers: Sphericity, Roundness, Sorting.

Sphericity and roundness data of quartz grains (of varying size) of sieve fractions are empirically shown to be non-normally distributed. It is also demonstrated that log transformations normalize the sphericity and roundness data. Laboratory experiments on sampling quartz grains from a sieve fraction show that the cone-and-quartering method is preferable as it yields similar results to those of the more time-consuming random sampling procedure. Results of laboratory measurement errors on two-dimensional sphericity and roundness data are also presented. The frequency of sphericity and roundness data are noted. For all parametric statistical studies of sphericity and roundness the sample statistics should be calculated according to normalizing log functions. Suitable grade scales of sphericity and roundness data are proposed based on log functions, the total range, and the minimum range of the variates (sphericity and roundness). (Knapp-USGS)
W70-08170

THE IDENTIFICATION OF ANCIENT BEACH SANDS BY THE COMBINATION OF SIZE ANALYSIS AND ELECTRON MICROSCOPY,
A. V. Hodgson, and W. B. Scott.
Sedimentology, Vol 14, No 1-2, p 67-75, April 1970. 9 p, 7 fig, 1 tab, 11 ref.

Descriptors: *Particle size, *Sieve analysis, *Electron microscopy, *Beaches, *Stratigraphy, Sedimentology, Sands, Petrography, Petrology, Sedimentary rocks.
Identifiers: Particle surface texture.

The combined use of size analysis and elec microscopy indicates the presence of beach s within the Lower Carboniferous Fell Sandsto southeast Scotland and northern England. Envi mental interpretations are based on a compa of the statistical parameters summarizing the distributions of the Fell Sandstone specimens similar data from modern sediments. The spre standard-deviation values (sorting coefficients dicates the presence of littoral, alluvial, possibly offshore marine environments within Fell Sandstone. These environments are fur defined by plotting standard deviation ag skewness on a scatter diagram. Electron mi graphs of the quartz grain surface texture selected Fell Sandstone specimens corroborate interpretations based on the size analysis and s all the diagnostic surface features developed modern quartz beach sand grains. (Knapp-USG
W70-08171

PHYSIOGRAPHIC FEATURES AND STRATI CATION TYPES OF COARSE-GRAINED PO BARS: MODERN AND ANCIENT EXAMPLES
Texas Univ., Austin. Bureau of Economic Geol
J. H. McGowen, and L. E. Garner.
Sedimentology, Vol 14, No 1-2, p 77-111, A 1970. 35 p, 25 fig, 1 tab, 25 ref.

Descriptors: *Sedimentary structures, *Allu channels, *Flood plains, *Bed load, *Suspen load, Sediment transport, Deposition (Sedimen Alluvium, Ripple marks, Dunes, Scour, Eros Meanders.
Identifiers: Colorado River (Tex), Amite R (La), Point bar deposits.

Primary sedimentary structures in modern po bar deposits of the Amite River in Louisiana the Colorado River in Texas are analogous to f tures observed in Eocene Simsboro and Pleisto Colorado River deposits of the Texas Gulf Coa Plain. Stratification consists of large-scale trou fill cross-stratification in the scour pool; trough cross-stratification and foreset cross-stratifica in the lower point bar; parallel laminae, la foreset cross-stratification,and trough-fill cr stratification in the chute bar; parallel inclin laminae, climbing ripple laminae, and mud dra in the chute fill; and parallel inclined laminae, drape, and foreset cross-stratification in overba flood-plain deposits. Fundamental differen between point bars of bed-load streams and mix load streams are that upper point bar sedime with small trough sets and parallel inclined lamin occur only in fine-grained (mixed load) flu deposits, and large scale foresets of chute bars common to coarse-grained (bed load) flu deposits but are not found in fine-grained fluvi deposits. Upward fining sequences, characteris of fine-grained fluvial deposits, are uncommon sediments deposited by bed-load streams such the Amite and Colorado rivers. (Knapp-USGS)
W70-08172

MICROPROBE STUDY OF DIAGENESIS CALCAREOUS ALGAE,
Hawaii Inst. of Geophysics, Honolulu.
Ralph Moberly, Jr.
Sedimentology, Vol 14, No 1-2, p 113-123, Ap 1970. 11 p, 6 fig, 14 ref.

Descriptors: *Diagenesis, *Limestones, *Alg *Coral, Marine algae, Atolls, Calcium carbona Reefs, Analytical techniques, Electron microsco
Identifiers: Eniwetok Atoll, Electron micropro analysis.

Diagenesis of calcareous algae was investigated electron microprobe. A few conceptacles and oth cavities in Recent algae specimens are partly completely filled with younger carbonate. In co trast to the surrounding skeleton of about 10-1 mol Mg-calcite, these deposits are either very l (0-2%) or very high (15-50%) in Mg conte Highest magnesian values in Recent algae studi are thought to be in high-Mg calcites rather than any other phase, with very few possible exceptio

alcian dolomite replacing fossil algae in cores om Eniwetok Atoll commonly has Ca-rich lenses sembling exsolution laminae. (Knapp-USGS)
/70-08173

VERCONSOLIDATION BY DESICCATION OF OASTAL LATE-QUATERNARY CLAYS IN SRAEL,
echnion - Israel Inst. of Tech., Haifa. Dept. of ivil Engineering.
mos Komornik, Vera Rohrlich, and Gdalyah Viseman.
edimentology, Vol 14, No 1-2, p 125-140, April 970. 16 p, 13 fig, 1 tab, 13 ref, append.

escriptors: *Clays, *Porosity, *Consolidation, Compaction, *Moisture content, Bottom sediments, Pressure, Drying, Laboratory tests.
dentifiers: *Israel, Desiccation (Clays).

ate Quaternary clays in Haifa Bay and Ashdod larbor, Israel, are overconsolidated by desiccaion. This conclusion was reached through analysis f the preconsolidation pressure as function of the ctual overburden pressure, and by analogy with lays undergoing desiccation, and confirmed in aboratory experiments. It is in agreement with the nown geology of the area. For pressures above 2.0 g/sq cm, a definite statistical relationship was stablished between the preconsolidation pressure nd the in situ void ratio. For lower pressures, the n situ void ratio is mainly governed by environental conditions during deposition and thought lso to be governed by the clay mineralogy. (K-napp-USGS)
W70-08174

FLUVIAL SEDIMENT CONCEPTS,
Geological Survey, Washington, D.C.
Harold P. Guy.
For sale by Superintendent of Documents, U S Government Printing Office, Wash, D C 20402 - Price $0.65. U S Geological Survey Techniques of Water-Resources Investigations, Book 3, Chapter C1, 1970. 55 p, 25 fig, 6 tab, 112 ref.

Descriptors: *Data collections, *Sedimentation, *Surveys, *Measurement, Sediment transport, Sedimentology, Alluvial channels, Alluvium, Streamflow, Suspended load, Bed load, Sediment load, Particle size, Erosion scour, Channel morphology, Sedimentary structures, Planning.
Identifiers: Sediment data needs.

Measurement of and recording of information about fluvial sediment and related environmental data needed to maintain and improve basic sediment knowledge are discussed. Concepts presented involve: (1) the physical characteristics of sediment which include aspects relative to weathering, soils, resistance to erosion, and particle size; (2) sediment erosion, transport, and deposition characteristics, including aspects relative to fine sediment and overland flow, coarse sediment and streamflow, variations in stream sediment concentration, deposition, and denudation; (3) geomorphic considerations, including aspects relative to the drainage basin, mass wasting, and channel properties; (4) economic aspects; and (5) data needs and program objectives to be attained through the use of several kinds of sediment records. (Knapp-USGS)
W70-08187

A QUANTITATIVE MODEL OF CLIMBING RIPPLES AND THEIR CROSS-LAMINATED DEPOSITS,
Reading Univ. (England). Sedimentology Research Lab.
J. R. L. Allen.
Sedimentology, Vol 14, No 1-2, p 5-26, April 1970. 22 p, 7 fig, 2 tab, 24 ref.

Descriptors: *Sedimentary structures, *Ripple marks, *Analytical techniques, *Stratigraphy, *Deposition (Sediments), Bed load, Sediment transport, Suspended load, Streamflow, Scour, Stream erosion, Mass transfer, Mathematical studies, Equations.
Identifiers: Climbing ripples, Cross-bedding.

The angle of climb of ripples in cross-laminated deposits is governed by a simple relation in which the angle of climb is a function of the rate of sediment deposition normal to the rippled bed, the ripple height, and the bedload sediment transport rate. This relation is developed using sediment transport functions and the assumptions of gradually varied flow to predict the spatial patterns of cross-lamination types in deposits due to pure nonuniform flow, pure unsteady flow, and simulataneous nonuniform and unsteady flow. Most of the predicted patterns can be matched from the geological record, and the analysis affords insight into the environmental significance of climbing-ripple cross-lamination. The analysis also results in a rigorous definition of the kinds of environmental interpretation that may legitimately be made from examples of this structure. (Knapp-USGS)
W70-08194

A STUDY OF THE DYNAMICS OF SUSPENDED MATTER BY MEANS OF NATURAL RADIOACTIVE TRACERS: AN APPLICATION TO THE GIRONDE ESTUARY,
Paris Univ., Thonon-les-Bains (France). Center for Geodynamic Research; and National Hydrological Lab., Chatou (France).
For primary bibliographic entry see Field 02L.
W70-08195

THE SEDIMENTS AND SEDIMENTARY PROCESSES OF THE EASTERN MISSISSIPPI CONE, GULF OF MEXICO,
Florida State Univ., Tallahassee. Dept. of Geology.
For primary bibliographic entry see Field 02L.
W70-08200

THE MEASUREMENT OF THE SIZES OF NONSPHERICAL PARTICLES BY THE HYDROMETER METHOD,
Reading Univ. (England). Sedimentology Research Lab.
C. McCann.
Sedimentology, Vol 13, No 3/4, p 307-309, December 1969. 3 p, 3 ref.

Descriptors: *Particle size, *Particle shape, *Measurement, *Hydrometers, Settling velocity, Instrumentation, Analytical techniques.
Identifiers: Equivalent particle diameter.

It is shown that in calculating the viscous force on a nonspherical particle suspended in a fluid, it is necessary to use the largest dimension of the particle. This may be calculated from the diameter of the equivalent sphere obtained from a hydrometer analysis provided the shape of the particle is known. (Knapp-USGS)
W70-08201

A METHOD TO STUDY THE DISTRIBUTION OF HEAVY-MINERAL GRAIN ABUNDANCE IN A TURBIDITE,
Mineral Research and Exploration Inst., Ankara (Turkey).
Teoman N. Norman.
Sedimentology, Vol 13, No 3/4, p 263-280, December 1969. 18 p, 8 fig, 4 tab, 18 ref.

Descriptors: *Sedimentary petrology, *Statistical methods, *Distribution patterns, *Frequency analysis, Sedimentation, Particle size, Particle shape, Turbidity currents, Density currents, Bottom sediments, Mineralogy.
Identifiers: *Turbidites.

Variations in the absolute frequencies of individual heavy-mineral species in a turbidite may best be studied by selecting a particular grain size as the 'nominal grain,' and numbers of grains of a particular mineral in all size classes can be converted to nominal grains. The total number of nominal grains per gram of sediment sample is defined as the 'nominal grain abundance,' which is a function of the volume (or weight) of the total mineral in the sample. Study of a simple, graded, Tertiary turbidite indicates that the least vertical change in heavy-mineral content occurs at, or slightly above, the middle part of the bed. Heavy minerals in the distal part of the turbidite have more uniform vertical distribution than in the proximal part. (Knapp-USGS)
W70-08202

GRAIN SIZE OF TURBIDITE RIPPLES,
Groningen Rijksuniversiteit (Netherlands). Geological Inst.
Ph. H. Kuenen, and F. L. Humbert.
Sedimentology, Vol 13, No 3/4, p 253-261, December 1969. 9 p, 2 fig, 8 ref.

Descriptors: *Sedimentary structures, *Ripple marks, *Particle size, *Turbidity currents, Density currents, Silts, Currents (Water), Velocity, Bed load, Suspended load.
Identifiers: Turbidites, Current ripples.

Many current ripples show log-normal grain-size distribution and good sorting. A range in medians was measured from fifty to several hundred microns. Turbidite ripples are log-normal, very well sorted and are restricted to medians of very fine sand to silt (less than 130 microns) because the particles are supplied in suspension at rippling velocity. Experimental suspension current ripples formed at about 50-60 cm/sec are similar in composition and structure to turbidite ripples. The continuous supply results in climbing ripples. The restricted grain size and the internal structure of turbidite ripples both form strong evidence against the action of normal currents. (Knapp-USGS)
W70-08203

GRAIN-SIZE IMAGE OF CLASTIC DEPOSITS,
R. Passega, and R. Byramjee.
Sedimentology, Vol 13, No 3/4, p 233-252, December 1969. 20 p, 5 fig, 9 ref.

Descriptors: *Particle size, *Correlation analysis, Statistics, Statistical methods, Analytical techniques, Mapping, Grading, Sands, Sediments, Sediment transport, Silts.
Identifiers: Grain-size image.

A clastic deposit may be represented by several diagrams. C-M diagrams in which C is the one-percentile, M the median of the grain-size distribution, characterize the coarsest fractions of the samples. F-M, L-M and A-M diagrams in which F, L and A, respectively, are the percentages by weight in the samples of grains finer than 125, 31 and 4 microns characterize the finest fractions. As a group, these diagrams form the 'grain-size image' of a deposit. These parameters were selected because they are closely related to transport and deposition mechanisms. As a consequence, the grain-size image gives fairly precise information on hydraulic conditions under which a deposit is formed. Relationships which exist between certain sizes of clastic grains and the most probable deposition mechanism are used to classify clastic sediments by subdividing them into types indicative of their genesis. Integrated with ecological determinations and sedimentary structure descriptions, grain-size facies maps are a means of environment analysis. (Knapp-USGS)
W70-08204

MEASUREMENT OF PARTICLE SHAPE BY FOURIER ANALYSIS,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
H. P. Schwarcz, and K. C. Shane.
Sedimentology, Vol 13, No 3/4, p 213-231, December 1969. 19 p, 11 fig, 1 tab, 16 ref.

Descriptors: *Measurement, *Particle shape, *Fourier analysis, Statistical methods, Sediments, Sands, Analytical techniques.
Identifiers: Particle shape analysis.

An objective procedure is described for quantifying the shape of two-dimensional closed curves from projections or sections of particles, for example, sand grains. The curves are plotted in polar coordinates, and a harmonic analysis is made by numerical analysis of measurements at equally spaced sample points along the curves. Quantities corresponding to the conventional properties of sphericity and roundness are derived from the Fourier coefficients. Three different measures of roundness are proposed and shown to correlate with visually estimated roundness classes, though also depending to some extent on sphericity. An attempt is described to study the interaction between these two properties by analysis of synthetically rounded plastic particles. (Knapp-USGS)
W70-08205

FLUORESCENT SAND AS A TRACER OF FLUVIAL SEDIMENT,
Geological Survey, Washington, D.C.
Vance C. Kennedy, and Dorothy L. Kouba.
For sale by Superintendent of Documents, U S Government Printing Office, Wash, D C 20402 - Price $0.30. U S Geological Survey Professional Paper 562-E, pp E1-E13, 1970. 13 p, 14 fig, 4 tab, 21 ref.

Descriptors: *Tracers, *Tracking techniques, *Sediment transport, *Dye releases, Radioactivity techniques, Sands, Tagging, Particle size, Bed load, Suspended load, Sampling, Fluorescence.
Identifiers: Dyed sand particles.

Stream sand coated with fluorescent paint was added at a constant known rate to Clear Creek at Golden, Colo., during a 28-hour period, and the concentration of fluorescent grains was monitored at a point 810 meters downstream from the point of introduction. Stream width in the study reach averaged about 21 m, mean velocity about 1.4 m/sec, and mean discharge 8.2 cu m/sec. Flow was very turbulent over a gravel bed. First-arrival time of fluorescent sand correlated with the square of grain diameter in the range 0.15-0.86 millimeters. Steady-state conditions apparently were achieved for the finer particles, with highest concentrations on the north side and lowest concentrations on the south side of the stream. Lateral mixing of coarser grains was much better than for finer grains. The sediment discharge computed from the tracer-dilution method was about 30% greater than the suspended-sediment discharge computed from suspended samples for the 0.15-0.18mm range and about 200% greater for the 0.38-0.52 mm range. (Knapp-USGS)
W70-08253

MODELLING OF SEDIMENT MOTIONS OFFSHORE,
Asian Institute of Technology, Bangkok (Thailand). Dept. of Engineering.
For primary bibliographic entry see Field 02L.
W70-08256

MOBILE BED HYDRAULICS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
T. Blench.
Text also in French. Journal of Hydraulic Research, Vol 8, No 2, p 159-187, 1970. 19 p, 8 fig, 1 tab, 17 ref.

Descriptors: *Sediment transport, *Alluvial channels, Hydraulics, Bed load, Suspended load, Sediment load, Turbulent flow, Regime, Streamflow, Open channel flow, Open channels, Channel morphology.
Identifiers: Mobile bed hydraulics.

A definite inductive science of mobile bed hydraulics has been forming during the last decade from a combination of facts and ideas about the self-formation of sediment-bearing canals and rivers, the visibly different phases of bed waves in flumes. Formalization is outlined along essentially the lines which initiated the friction-factor diagram of rigid boundary hydraulics for circular pipes. Recommendations are listed for use in formalizing mobile bed hydraulics and for orienting future research. (Knapp-USGS)
W70-08259

JUMPLIKE MOVEMENT OF A SOLID PARTICLE AT THE BOTTOM OF A TURBULENT STREAM,
K. I. Rossinskiy, and K. S. Lyubomirova.
Transl from Trudy Gos. Gidrologicheskogo Instituta, No 162, p 221-235, 1969. Soviet Hydrology: Selected Papers, Issue No 1, p 38-49, 1969. 12 p, 8 fig, 1 tab, 3 ref.

Descriptors: *Sediment transport, *Saltation, *Model studies, Hydraulic models, Flumes, Tractive forces, Suspended load, Bed load, Particle size, Velocity.
Identifiers: *USSR.

To study the movement of sediments in the transitional stage between rolling and suspension, the Moscow Laboratory of the State Hydrologic Institute and the Department of Physics of Moscow State University have taken moving films of rolling and jumping gravel particles in a uniform turbulent stream. The moving films were taken in two series with different bottom roughnesses and flow regimes. The movement of individual gravel particles in the second series of experiments was accompanied by the movement of a suspended load made of suspended polystyrene balls 1-1.15 mm in diameter and of a density of 0.98-1.04. The experiments were made in a glass flume of variable slope, 8 m long and 0.5 m kigh and wide. The optical axis of the camera was directed across the stream and was located 123 cm from the floor. (Knapp-USGS)
W70-08265

RELATIONSHIPS BETWEEN LANDSCAPE-GEOMORPHOLOGICAL FACTORS AND SEDIMENT DISCHARGE IN RIVERS OF WESTERN TRANSCAUCASIA,
L. F. Litvin.
Transl from (Vestnik MGU, geogr. ser.), No 4, p 60-64, 1969. Soviet Hydrology: Selected Papers, Issue No 1, p 85-88, 1969. 4 p, 4 fig.

Descriptors: *Sediment yield, *Geomorphology, Provenance, Suspended load, Bed load, Regime, Sediment discharge, Discharge (Water).
Identifiers: *USSR, Transcaucasia.

The Moscow State University Black Sea Expedition determined the sediment discharge at the mouth stations on rivers in western Georgia. All river basins were classified by factors determining sediment discharge, and the sediment discharge was measured in rivers typical of different groups. The basins of some of these rivers (Kodori Bzyb', Inguri) include areas falling in all elevation zones; the headwater of the others in general do not extend beyond the zone of mountains of intermediate elevation. All these rivers pass through the foothills zone and coastal lowland. A definite correlation between the mean elevation of a basin and the runoff of Caucasian rivers has been established. The elevation of the area, the landscape-geomorphological factors governing the existence of an elevational zonality of landscapes, and lithology exert the greatest effect on the modulus of suspended sediment discharge. The steep slopes in the longitudinal profiles of rivers and abundant precipitation in the mountainous country virtually ensure the transport of all suspended sediments beyond its limits. The runoff modulus of bed-load discharge depends primarily on the change in the competence of a stream along its length and the closeness of the sources of coarse material. (Knapp-USGS)
W70-08273

MUD VOLCANO CLAY, TRINIDAD, W. I.,
Columbia Univ., New York. Dept. of Geology.
Paul F. Kerr, and Darlene S. Richardson.
Available from Clearinghouse as AD-691 $3.00 in paper copy, $0.65 in microfiche. US Force Cambridge Research Laboratories, Bedf Mass, Scientific Report No 3, April 16, 1969. 2 8 fig, 4 tab, 19 ref. USAF Project No 8623-02-0

Descriptors: *Volcanoes, *Mud, *Movem Geology, Gases, Geologic control, Sedime Clays, Structural geology, Mineralogy.
Identifiers: Mud volcanoes, Trinidad (W. I.), T otropic mud.

Laboratory studies of clay mineral samples w made from two mud volcanoes in the islan Trinidad. The mineral content and physical pro ties were compared with clay samples from Lower Cruse and Nariva Formations thro which the throats of the mud volcanoes are lieved to penetrated. Earlier studies sugg that the mud volcanoes formed either as a resul tectonic movement, accumulated gas pressure, combination of the two mechanisms. The t otropic character of the clay may have greatly celerated wither mechanism. Thixotropic clay s rated with water becomes a highly mobile fluid great transporting power. Where such a mo mass accumulates along a partly broken anticli structure, any release of pressure will occur ward. A gas pocket, tectonic squeeze, or both provide pressure to maintain upward motion. this way, the clay would be extruded to form a m volcano. Although moving vertically and suppor by gas and tectonic pressure, the clay flowage characteristics comparable to horizontal c movement in landslides where gas is not involv and motion is maintained by gravity. (Knap USGS)
W70-08280

ECOLOGICAL SURVEYS FROM SPACE.
National Aeronautics and Space Administrati Washington, D.C. Office of Technology Utili tion.
For primary bibliographic entry see Field 07B.
W70-08465

DISTRIBUTION OF DOLOMITE IN A TIDA FLAT ENVIRONMENT, SUGARLOAF KE FLORIDA,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 02L.
W70-08483

SETTLING VELOCITY OF GRAINS C QUARTZ AND OTHER MINERALS IN SE WATER VERSUS PURE WATER,
Geological Survey, Menlo Park, Calif.
Charles I. Winegard.
For sale by the Superintendent of Documents U. Government Printing Office, Washington, D. 20402 - Price $3.25. In: Geological Surv Research 1970, Chapter B, US Geological Surv Professional Paper 700-B, p B161-B166, 1970. 6 2 fig, 3 tab, 7 ref.

Descriptors: *Settling velocity, *Salinity, *Fre water, *Sea water, *Particle size, Viscosity, Den ty, Mineralogy, Sedimentation, Deposition (Sed ments), Quartz, Clay minerals.
Identifiers: US Geological Survey.

The settling velocities of particles in sea wa differ significantly from those in fresh water. F example, a 10-micron-diameter quartz sphere sea water will settle 4,000 meters in 882 days. T same particle in fresh water will settle to that dep in 824 days, 6.58 percent less time. Velocities sea water can be calculated for a spherical partic of given size and composition if the viscosity a specific gravity of the water are known. (Knap USGS)
W70-08484

MEANDERING OF THE ARKANSAS RIVER SINCE 1833 NEAR BENT'S OLD FORT, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02E.
W70-08490

SANDBAR DEVELOPMENT AND MOVEMENT IN AN ALLUVIAL CHANNEL RIO GRANDE NEAR BERNARDO, NEW MEXICO,
Geological Survey, Albuquerque, N.M.
K. Culbertson, and C. H. Scott.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402 - Price $3.25. In: Geological Survey Research 1970, Chapter B, US Geological Survey Professional Paper 700-B, p B237-B241, 1970. 5 p, 3 fig, 5 ref.

Descriptors: *Alluvial channels, *Rio Grand, *New Mexico, *Sedimentary structures, *Sediment transport, Channel morphology, Dunes, Ripple marks, Sand waves, Sand bars, Regime, Scour, Deposition (Sediments), Particle size, Sands.
Identifiers: Sorting (Sediments).

Sonic sounder records were used to document the development and movement of transverse bars in the Rio Grande conveyance channel near Bernardo, N. Mex. Rate of movement was about 350 and 370 feet per day for two transverse bars observed. Depth of flow was less and velocity of flow was greater over the bars than in the dune reaches, but the water-surface slopes were equal. Median size of bed-surface material on the backs of bars was finer than the bed-surface material in the dune reaches. The mechanics of formation and movement of transverse bars is obscure; however, the bars may be formed by the coalescence of large dunes, and movement is caused by scour of the bar at the upstream end and deposition at the downstream end. A natural sorting of bed material at the upstream end of the bar is also indicated. (Knapp-USGS)
W70-08495

EVALUATION OF A METHOD FOR ESTIMATING SEDIMENT YIELD,
Geological Survey, Denver, Colo.
Lynn M. Shown.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402 - Price $3.25. In: Geological Survey Research 1970, Chapter B, US Geological Survey Professional Paper 700-B, p B245-B249, 1970. 5 p, 2 fig, 2 tab, 10 ref.

Descriptors: *Sediment yield, *Estimating, *Small watersheds, Reservoir silting, Geology, Soil properties, Climates, Runoff, Topography, Vegetation effects, Land use, Erosion, Channel erosion, Stream erosion, Soil erosion, Sediment transport.
Identifiers: Sediment yield estimation.

A method for estimating annual sediment yield, developed by the Pacific Southwest Inter-Agency Committee, was tested in 28 small watersheds ranging in size from 0.02 to 37 square miles. These watersheds for which hydrologic records exist are in arid and semiarid areas of western Colorado, north-central New Mexico, and east-central Wyoming, and represent a variety of geologic, climatic, ecologic, and topographic conditions. Estimates of sediment yield correlated closely with sediment yields measured in reservoirs, but the estimates were usually lower than the measured yields. The method was designed to make general sediment classification for areas greater than 10 square miles, but it also appears to work nearly as well for watersheds that are as small as 0.1 square mile. (Knapp-USGS)
W70-08497

2K. Chemical Processes

AUTOMATED POTENTIOMETRIC TECHNIQUES FOR THE ON-SITE MONITORING OF ANION CONCENTRATIONS IN WATER,
Missouri Water Resources Research Center, Columbia.
For primary bibliographic entry see Field 05A.
W70-08156

NITRATE ION-SELECTIVE ELECTRODE IN MICROBIAL MEDIA,
Missouri Water Resources Research Center, Columbia.
For primary bibliographic entry see Field 05A.
W70-08157

FLUORIDE ELECTRODE AS A REFERENCE IN THE DETERMINATION OF NITRATE ION,
Missouri Water Resources Research Center, Columbia.
For primary bibliographic entry see Field 05A.
W70-08158

ION-SELECTIVE ELECTRODES FOR NITRATE ANALYSIS,
Missouri Water Resources Research Center, Columbia.
For primary bibliographic entry see Field 05A.
W70-08159

LOW TEMPERATURE PRECIPITATION TITRATION OF PERCHLORATE AND TETRAFLUOROBORATE WITH TETRAPHENYLARSONIUM CHLORIDE AND ION-SELECTIVE ELECTRODES,
Missouri Water Resources Research Center, Columbia.
For primary bibliographic entry see Field 05A.
W70-08160

SULFIDE TO SULFATE REACTION MECHANISM--A STUDY OF THE SULFIDE TO SULFATE REACTION MECHANISM AS IT RELATES TO THE FORMATION OF ACID MINE WATERS.
Ohio State Univ. Research Foundation, Columbus.
For primary bibliographic entry see Field 05G.
W70-08161

AN EXAMPLE OF THE STUDY OF ISOTOPIC HYDROLOGY IN A SEMI-ARID REGION, THE BASIN OF LAKE CHAD (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France); United Nations Educational, Scientific and Cultural Organization, Paris (France). Office of Hydrology; and Groningen Rijksuniversiteit (Netherlands). Natuurkundig Laboratorium.
H. Faure, J. Ch. Fontes, C. E. Gischler, W. G. Mook, and J. C. Vogel.
Journal of Hydrology, Vol 10, No 2, p 141-150, February 1970. 10 p, 1 fig, 14 ref.

Descriptors: *Hydrogeology, *Groundwater, *Surface-groundwater relationships, *Radioactivity techniques, *Radioactive dating, Groundwater movement, Deuterium, Tritium, Stable isotopes, Oxygen, Model studies.
Identifiers: Oxygen isotopes, Lake Chad Basin.

Study of water resources in the Lake Chad Basin, undertaken by UNESCO since 1966, consists of the preparation of a map of the entire basin, an analog model, and an examination of all previous studies. To verify and control existing data, a complementary isotopes study was made, including determinations of H-2, O-18, C-14, C-13 and tritium. The average rainfall at present feeding the aquifers in the Chad Basin has an O-18 content of -6 ppt relative to the SMOW standard. Because of evaporation the water of the Chari River, representing about 90% of the total input in the Lake Chad, becomes enriched in O-18 from about -4 ppt to +17 ppt at the northeast border areas of the lake. The groundwaters near Lake Chad generally have -4 to -7 ppt O-18. In the aquifers ages of over 40,000 years are found by C-14 analyses. Some groundwaters in the North of the Chad Basin with O-18 contents of -8 to -11 ppt suggest climatic conditions perceptibly different from the present climate, with lower temperatures and a higher relative humidity. (Knapp-USGS)
W70-08177

HYDROGEN ISOTOPIC FRACTIONATION OF WATER PASSING THROUGH TREES,
Geological Survey, Denver, Colo.; and Agricultural Research Service, Fort Collins, Colo.
R. L. Wershaw, Irving Friedman, S. J. Heller, and P. A. Frank.
In: Advances in Organic Geochemistry-1966, International Series of Monographs in Earth Sciences, Vol 32, Proceedings of 3rd International Conference on Organic Geochemistry, London, England, September, 1966, p 55-67, 1970. 13 p, 6 fig, 6 tab, 6 ref.

Descriptors: *Evapotranspiration, *Stable isotopes, *Deuterium, Transpiration, Evaporation, Circulation (Plants), Consumptive use, Spectrometers.
Identifiers: Mass spectrometry.

Mass spectrometry was used to compare deuterium content in trees with that of the water sources used by the trees. The water in the leaves of a tree is enriched in deuterium with respect to the water in the phloem and the xylem of the tree which, in turn, are enriched in deuterium with respect to the groundwater beneath the tree. The enrichment in the leaves is apparently due to isotopic fractionation that takes place during transpiration, and the amount of fractionation is a function of the rate of transpiration from the tree; the transpiration rate is dependent upon temperature, relative humidity and solar radiation level. Two different processes have probably contributed to the enrichment of deuterium in the water in the phloem and xylem tissue: (1) movement of water from the leaves down into the trunk of the tree, and (2) enrichment of deuterium in the soil water surrounding the tree roots by evaporation. The isotopic composition of the water vapor coming from the soil should therefore be different from that of the water vapor from tree leaves, and it should, consequently be possible to calculate, by making a materials balance, the ratio of the amount of water evaporating from soil to the amount of water transpiring from leaves in a given area. (Knapp-USGS)
W70-08186

COLLIGATIVE PROPERTIES OF ANOMALOUS WATER,
Bristol Univ. (England). Dept. of Physical Chemistry.
For primary bibliographic entry see Field 01B.
W70-08189

SALTING COEFFICIENTS FROM SCALED PARTICLE THEORY,
Connecticut Univ., Storrs. Dept. of Chemistry.
For primary bibliographic entry see Field 01B.
W70-08191

STRUCTURES OF ALUMINUM HYDROXIDE AND GEOCHEMICAL IMPLICATIONS,
Geological Survey, Menlo Park, Calif.
Robert Schoen, and Charles E. Roberson.
American Mineralogist, Vol 55, p 43-77, January-February 1970. 35 p, 11 fig, 2 tab, 54 ref.

Descriptors: *Geochemistry, *Mineralogy, *Clay minerals, *Crystal growth, *X-ray diffraction, Laterites, Soil formation, Bonding, Catalysts, Silicates, Weathering, Aluminum.
Identifiers: *Gibbsite, *Bayerite, *Nordstrandite, *Aluminum hydroxide, Crystal chemistry, Bauxites.

Synthesis experiments in the alumina-water system at room temperature indicate that the gibbsite polymorph precipitates slowly from solutions whose pH is below the point of minimum solubility (pH 5.8), and the bayerite polymorph precipitates rapidly from solutions whose pH is above 5.8. Nordstrandite, the third polymorph of aluminum hydroxide, forms from bayerite during aging at intermediate to high pH values. In solutions of intermediate pH, both gibbiste and bayerite form, but with aging, early-formed gibbsite disappears as more bayerite forms. The extent of polarization by the aluminum cations determines whether the hydroxyl ions will possess cylindrical symmetry as in bayerite or tetrahedral symmetry as in gibbsite. It is suggested that the extent of polarization is inherited from the polarization in aqueous aluminum complexes. The usual abundance of the silicate ion in natural alkaline environments may explain the scarcity of nordstrandite, for the silicate ion may favor the precipitation of aluminosilicate minerals. Near absence of bayerite in nature may indicate that it is metastable and inverts to nordstrandite. (Knapp-USGS)
W70-08193

PALYNOLOGICAL TRACING OF SALINE WATER SOURCES IN LAKE KINNERET REGION (ISRAEL),
Hebrew Univ., Jerusalem (Israel). Dept. of Geology.
For primary bibliographic entry see Field 02H.
W70-08209

CARBON ISOTOPE FRACTIONATION DURING THE PRECIPITATION OF CALCIUM CARBONATE,
Heidelberg Univ. (West Germany). Physikalisches Institut.
K. Emrich, D. H. Ehhalt, and J. C. Vogel.
Earth and Planetary Science Letters, Vol 8, No 5, p 363-371, June 1970. 9 p, 2 fig, 3 tab, 16 ref.

Descriptors: *Stable isotopes, *Carbon, *Carbonates, *Bicarbonates, *Sea water, Chemical precipitation, Sedimentation, Carbon dioxide, Calcium carbonate, Tracers, Tracking techniques.
Identifiers: Isotopic fractionation, Carbon isotopes.

The fractionation of the carbon isotopes C-12 and C-13 in the equilibrium system CO2 (gas)-HCO3 (dissolved-CaCO3, solid) was measured at temperatures between 20 deg C and 60 deg C. The fractionation between solid carbonate and gaseous carbon dioxide is + (1.017 plus or minus 0.018)% at 20 deg C and the temperature dependence is - (0.0063 plus or minus 0.0008)%/deg C at 20 deg C. The corresponding fractionations between carbonate and bicarbonate (cb), and bicarbonate and carbon dioxide (bg) at 20 deg C are: cb, + (0.185 plus or minus 0.023)%, + (0.0035 plus or minus 0.0013)%/deg C; and bg, + (0.838 plus or minus 0.012)%, - (0.0109 plus or minus 0.0005)%/deg C. (Knapp-USGS)
W70-08232

BARIUM IN SEA WATER,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
K. Wolgemuth, and W. S. Broecker.
Earth and Planetary Science Letters, Vol 8, No 5, p 372-378, June 1970. 7 p, 6 fig, 3 tab, 14 ref. NSF Grant GA 1188.

Descriptors: *Water chemistry, *Sea water, *Trace elements, Sampling, Tracers, Radioisotopes, Stable isotopes, Analytical techniques, Radiochemical analysis.
Identifiers: Barium, Barium compounds, Isotope dilution analysis.

Vertical profiles of barium content were determined in the Atlantic and Pacific Oceans by the isotope dilution method. The Atlantic shows a range from 8 to 14 and the Pacific from 8 to 31 micrograms/liter (surface to deep water, respectively). Barium is incorporated into the remains of organisms in the surface ocean and released to the deep sea as the organic debris sinks toward the bottom. The greater surface to deep concentration increase observed in the Pacific is consistent with that found for other biologically active elements (Si, C, N, P, and others). The similarity of Ba and Ra profiles supports the expected chemical coherence between these elements. (Knapp-USGS)
W70-08233

RADIOISOTOPES IN WATERS OF NEOVOLCANIC REGIONS OF THE CAUCASUS,
Akademiya Nauk SSSR. Institut Geologii.
V. M. Kuptsov, V. V. Cherdyntsev, and V. L. Zverev.
Translated from Geokhimiya, No 9, p 1153-1155, 1969. Geochemistry International, Vol 6, No 5, p 919-922, 1969. 4 p, 2 tab, 5 ref.

Descriptors: *Radioisotopes, *Trace elements, *Groundwater, *Volcanoes, Magmatic water, Streams, Thermal water, Radium radioisotopes, Uranium radioisotopes, Radiochemical analysis.
Identifiers: Thorium, USSR, Caucasus.

Concentrations and ratios of U-238, U-234, Th-232, Th-228, Ra-226, and Rn were measured in waters from the Caucasus where volcanic activity occurred several thousand years ago. Low radium concentrations and Ra/U ratios suggest radium loss from the waters; high U/Rn ratios are attributed to lower diffusion rates from cold extrusives than from the heated rocks of areas of active volcanism. (Knapp-USGS)
W70-08261

GOLD IN THE MODERN SEDIMENTS OF THE NORTHERN PART OF THE ATLANTIC OCEAN BASIN,
G. N. Anoshin, E. M. Yemel'yanov, and G. A. Perezhogin.
Translated from Geokhimiya, No 9, p 1120-1129, 1969. Geochemistry International, Vol 6, No 5, p 897-905, 1969. 9 p, 6 fig, 4 tab, 16 ref.

Descriptors: *Gold, *Trace elements, *Bottom sediments, *Atlantic Ocean, Particle size, Sedimentation, Sedimentary rocks, Water chemistry, Sampling, Neutron activation analysis.
Identifiers: USSR.

Average gold contents in modern marine clastic sediments (1.3 ppb in the Atlantic Ocean, up to 6.0 ppb in the Black Sea) are close to the published averages for sedimentary rocks. The coquinoid limestones of the Black Sea are enriched in gold (up to 150 ppb), and elsewhere in the Atlantic basin biogenic limestones contain from 0.7 to 9.0 ppb of gold. There is a well defined positive correlation between the contents of gold and organic matter in the sediments. In clastic sediments, gold content increases with decrease in grain size, but this correlation is not observed in the biogenic sediments. (Knapp-USGS)
W70-08262

REMOBILIZATION OF PHOSPHATES AND MICRO-NUTRIENTS AND THEIR EFFECT ON THE PRODUCTION OF PLANKTON IN WATER CULTURES (IN GERMAN),
J. Clasen, and H. Bernhardt.
English summary. Archiv fur Hydrobiologie, Vol 65, No 4, p 528-538, 1969. 4 fig, 6 tab, 20 ref.

Descriptors: *Silts, *Phosphates, Sediments, Reservoirs, Rivers, Testing, Algae, Phytoplankton.
Identifiers: Soluble phosphate, Suspended particulates, Wahnbach River (Germany), Wahnbach Reservoir (Germany), Germany, Chlorella, Cryptomonas, Oscillatoria rubescens.

The suspended particulates of the River Wahnbach (Germany), largely silt, were separated by filtration and added in various amounts to flasks filled with river water or water from its terminal reservo
The flasks were incubated in the dark, at rest, a
under aerobic conditions for a fortnight. Su
sequent analyses of water above the sedime
revealed no change in phosphate concentration
flasks with river water, but a liberation of abo
15% of phosphate from the silt in flasks with wa
of the reservoir. The difference is explained by
presumable state of equilibrium existing
phosphorus-rich river water and a deficiency of f
element in water of the basin. Tank trials wi
water enriched in either silt or soluble phospha
and several species of algae failed to yield conc
sive results. Some test organisms, particula
Chlorella spp, attained maximum density in c
tures with soluble phosphates. Other algae (Cry
tomonas spp) grew better in silt containing c
tures. This effect is attributed to the presence
some unidentified growth-promoting ingredients
the silt, aside from the liberated phosphate
(Wilde-Wisconsin)
W70-08357

**RECORDS OF WATER LEVELS AND CHEMI
CAL ANALYSES FROM SELECTED WELLS I
PARTS OF THE TRANS-PECOS REGION, TE
AS, 1965-68,**
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02F.
W70-08480

**SPECTROCHEMICAL DETERMINATION O
MICROGRAM QUANTITIES OF GERMANIU
IN NATURAL WATER CONTAINING HIG
CONCENTRATIONS OF HEAVY METALS,**
Geological Survey, Sacramento, Calif.
For primary bibliographic entry see Field 05A.
W70-08496

**QUANTITY AND CHEMICAL QUALITY O
LOW FLOW IN CIBOLO CREEK, TEXAS
MARCH 4-8, 1968,**
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02E.
W70-08509

**DETERMINATION OF TOTAL NITROGEN
PHOSPHORUS AND IRON IN FRESH WATE
BY PHOTO-OXIDATION WITH ULTRAVIOLE
RADIATION,**
Norsk Institutt for Vannforskning, Oslo.
For primary bibliographic entry see Field 05A.
W70-08513

**GENERAL PROBLEMS IN THE THEORY O
IONIC HYDRATION IN AQUEOUS SOLU
TIONS,**
Akademiya Nauk SSSR, Moscow. Institu
Obshchei i Neorganicheskoi Khimii.
For primary bibliographic entry see Field 01B.
W70-08518

**STRUCTURE OF WATER IN CRYSTALLINE
HYDRATES OF CERTAIN BIOLOGICALLY IM
PORTANT COMPOUNDS,**
Akademiya Nauk SSSR, Moscow. Institu
Obshchei i Neorganicheskoi Khimii.
For primary bibliographic entry see Field 01B.
W70-08527

2L. Estuaries

**SENSITIVITY OF BENTHIC MICROFLORA TO
POLLUTION GRADIENTS,**
Rhode Island Univ., Kingston. Graduate School o
Oceanography.
For primary bibliographic entry see Field 05C.
W70-08164

METHOD FOR PREDICTING POLLUTANT TRANSPORT IN TIDAL WATERS,
California Univ., Berkeley. Hydraulic Lab.
For primary bibliographic entry see Field 05B.
W70-08168

THE FLOOR OF CENTRAL SAN FRANCISCO BAY,
Geological Survey, Washington, D.C.
Paul R. Carlson, Tau R. Alpha, and David S. McCulloch.
Mineral Information Service, Vol 23, No 5, p 97-107, May 1970. 11 p, 7 fig, 2 map, 1 tab, 12 ref.

Descriptors: *Bathymetry, *Topography, *Bottom sediments, *Bays, Profiles, Mapping, Surveys, Tides, Tidal effects, Scour, Erosion, Geomorphology, Sounding, Depth, Hydrography, Sand waves, Sediment transport.
Identifiers: *San Francisco Bay.

Central San Francisco Bay has a complex morphology that has resulted largely from stream erosion, which produced a highly irregular floor on the tectonically deformed bedrock, and from complex tidal circulation, which has generated currents that have simultaneously scoured deep modern channels and deposited sediment to produce extensive shoals. The wide range of energy environments that exists in the central bay is reflected in the grain size and thickness of the unconsolidated sediment and the morphology of the modern bay floor. Where current and wave-energy levels are low, such as in Richardson Bay and the Berkeley mud flats, the resulting thick sequence of unconsolidated sediment is predominantly silt and clay. As the amount of energy increases, the grain size becomes larger and sand predominates, as it does over most of the central bay. With increasing energy, large sand waves are formed on the bottom, and in the highest energy environments, such as beneath the Golden Gate Bridge, the bedrock appears to be swept clean of sediment. The thickness of sediments as shown on acoustic subbottom profiles varies from none over bedrock knobs and the flanks of the islands to more than 250 feet in parts of the central bay. (Knapp-USGS)
W70-08181

A STUDY OF THE DYNAMICS OF SUSPENDED MATTER BY MEANS OF NATURAL RADIOACTIVE TRACERS: AN APPLICATION TO THE GIRONDE ESTUARY,
Paris Univ., Thonon-les-Bains (France). Center for Geodynamic Research; and National Hydrological Lab., Chatou (France).
J. M. Martin, M. Meybeck, and M. Heuzel.
Sedimentology, Vol 14, No 1-2, p 27-37, April 1970. 11 p, 7 fig, 7 ref.

Descriptors: *Suspended load, *Tracers, *Radioactivity techniques, *Instrumentation, Estuaries, Rivers, Sediment transport, Sediments, Provenance, Sediment load, Turbidity, Potassium radioisotopes, Tracking techniques.
Identifiers: Gironde Estuary (France).

The determination of the natural radioelements in suspended matter in rivers and estuaries lead to a simple exponential relation between gamma activity and turbidity. A new turbidimetry method is based on this relation. In situ measurements have been conducted with field gamma scintillometers and compared with different turbidimetry methods, such as nephelometry, gravimetry and gamma ray absorptiometry. This method has been particularly convenient to continuous in situ measurements of turbidity from 0.5 to several hundreds of g/liter. This broad range is very well adapted to turbidity studies in estuaries. The new method was applied to study suspended matter dynamics in the Gironde Estuary (France) during November 1968, as a part of a more general study of natural radioactivity in terrigenous sediments brought into the ocean. (Knapp-USGS)
W70-08195

THE SEDIMENTS AND SEDIMENTARY PROCESSES OF THE EASTERN MISSISSIPPI CONE, GULF OF MEXICO,
Florida State Univ., Tallahassee. Dept. of Geology.
Ter-Chien Huang.
Florida State University Sedimentology Research Laboratory Contribution No 31, December 1969. 124 p, 11 fig, 6 tab, 114 ref, append.

Descriptors: *Bottom sediments, *Deltas, *Mississippi River, *Sedimentary structures, *Sedimentary rates, Turbidity currents, Silts, Clays, Deposition (Sediments), Sediment distribution, Sediment transport, Gulf of Mexico.
Identifiers: Mississippi Cone.

Sedimentary processes on the eastern Mississippi Cone were interpreted from sedimentary structures, textures, and compositions as well as from bathymetry, bottom photographs and continuous seismic profiles of the deep-sea fan. Twenty-nine piston cores and 25 gravity cores show that the sediments consist of a repetitious vertical succession of gray silts and silty clays intercalated with occasional layers of fine sand. Each core is topped by a 20 to 50 cm layer of yellowish brown foraminiferal clay. Disequilibrium age determinations indicate that the lower silty layers, representing the deposits of latest low sea level stands, were deposited more rapidly than the upper foraminiferal clays. These sedimentation rates depend primarily on the rate of the detrital influx and sea level change and average about 30 cm/1000 years. The primary mechanisms of sediment transport are differential pelagic settling and low-flow regime bottom currents, with mass movements by sliding or slumping common in channel and slope areas. (Knapp-USGS)
W70-08200

GRAIN-SIZE IMAGE OF CLASTIC DEPOSITS,
For primary bibliographic entry see Field 02J.
W70-08204

A MARYLAND COASTAL AQUIFER,
Maryland State Geological Survey, Baltimore.
Harry J. Hansen.
Journal American Water Works Association, Vol 62, No 5, p 286-292, May 1970. 7 p, 8 fig, 2 tab, 10 ref.

Descriptors: *Water management (Applied), *Model studies, *Decision making, *Atlantic Coastal Plain, *Aquifers, Groundwater, Groundwater movement, Planning.
Identifiers: Groundwater zoning models.

A managerial model based on the zoning concept is outlined for use with areally extensive artesian aquifers occurring in several layers; artesian aquifers of this description characterize the Coastal Plain states from New Jersey to Texas. The model is inapplicable to water-table situations. It assumes humid-area conditions in which precipitation is not so important a limiting factor as the permeability and thickness of the aquifer, the hydraulic gradient between the artesian aquifer and its outcropping recharge belt, and the amount of leakage occurring through confining beds. Applying field data, each of the major artesian aquifers occurring beneath Southern Maryland and the Eastern Shore are subdivided into several user categories. To illustrate this procedure, discussion is focused initially on a specific formation---the Aquia Aquifer. (Knapp-USGS)
W70-08227

BARIUM IN SEA WATER,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 02K.
W70-08233

CURRENT WATER QUALITY CONDITIONS AND INVESTIGATIONS IN THE UPPER POTOMAC RIVER TIDAL SYSTEM,
Federal Water Quality Administration, Annapolis, Md. Chesapeake Technical Support Lab.
For primary bibliographic entry see Field 05B.
W70-08248

PRELIMINARY ANALYSES OF THE WASTE WATER AND ASSIMILATION CAPACITIES OF THE ANACOSTIA TIDAL RIVER SYSTEM,
Federal Water Quality Administration, Annapolis, Md. Chesapeake Technical Support Lab.
For primary bibliographic entry see Field 05A.
W70-08249

LITHIFICATION OF DEEP SEA SEDIMENTS BY PYRITE,
Duke Univ., Durham, N. C. Dept. of Geology; and Duke Univ., Beaufort, N. C. Marine Lab.
Michael E. Field, and Orrin H. Pilkey.
Nature, Vol 226, p 836-837, May 30, 1970. 2 p, 3 fig, 7 ref.

Descriptors: *Lithification, *Sediments, *Pyrite, *Continental shelf, Atlantic Ocean, North Carolina, Core drilling, Diagenesis.
Identifiers: *Hatteras Outer Ridge, *Hatteras Canyon System.

Unique pyrite-cemented silty sand layers have been found in three out of 35 piston cores taken from the North Carolina lower continental rise at depths from 4,770 to 4,950 m. The layers are approximately 0.5 cm thick and consist mainly of terrigenous grains in a cement identified as pyrite by X-ray diffraction analysis. None of the precursor iron sulfides commonly associated with sedimentary pyrite were found. The pyritized layers are geologically significant because they must play a part in restricting and channeling vertical exchange between seawater and sediment as well as in interstitial water reactions and migrations. Although the layers are thin and volumetrically unimportant in the local sediment column, the occurrence is of great interest because such cementation by pyritization is one of only two known mechanisms of lithification in the uppermost portions of deep sea sediments. (Woodard-USGS)
W70-08250

VARIABLE BOUNDARY, TWO DIMENSIONAL TIDAL MODEL,
Alaska Univ., College. Inst. of Marine Science.
J. B. Matthews, and J. C. H. Mungall.
Nature, Vol 226, p 835-836, May 30, 1970. 2 p, 2 fig, 4 ref.

Descriptors: *Estuaries, *Mathematical models, *Currents (Water), *Tides, *Computer programs, Digital computers, Profiles, Model studies, Tidal waters.
Identifiers: *Variable boundary tidal model.

A two dimensional program which can be used to solve semidiurnal tidal problems in estuaries is described. The mathematical basis for the analysis is derived from a two-dimensional explicit model originally developed for the North Sea, using the North Sea model's basic differential equations, equations of motion in two horizontal dimensions, and the equation of continuity. Solution of the equations, by finite difference methods, is facilitated by a grid layout and is staggered in time and space. The grid can be terminated at alternate lines in both directions to represent either open or closed boundaries. An integer control matrix is built in the computer from separate linear integer matrices for each row and column of the grid. The input is by punched card. The model has been applied to several examples, both theoretical and practical, with excellent results. (Woodard-USGS)
W70-08252

A LAGRANGIAN METHOD FOR PREDICTING POLLUTANT DISPERSION IN BOLINAS LAGOON, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 05B.
W70-08254

MODELLING OF SEDIMENT MOTIONS OFFSHORE,
Asian Institute of Technology, Bangkok (Thailand). Dept. of Engineering.
Richard Silvester.
Text also in French. Journal of Hydraulic Research, Vol 8, No 2, p 229-259, 1970. 31 p, 9 fig, 38 ref.

Descriptors: *Hydraulic models, *Sediment transport, *Waves (Water), *Bed load, Unsteady flow, Continental shelf, Beaches, dunes, Ripple marks, Mass transfer, Suspended load, Flumes, Currents (Water), Littoral drift, Erosion.
Identifiers: Wave modeling.

Water particle motion at the sea bed beyond the breaker line is essentially a linear oscillation along the line of wave advance for a single wave train. When two wave trains are angled to each other, the resultant motion varies from linear in two directions to elliptical and circular in a horizontal plane. The techniques used to study sediment transport in the offshore zone are discussed and a new modeling concept is introduced. A block or mass of water is oscillated in a flume, superimposing oscillatory motion on steady flow. The most realistic replication of wave motion in the deeper zones of the Continental Shelf should include angled wave trains. The principle of the 'water block' could be extended for this purpose. A cylindrical box with vertical axis and open bottom could be oscillated in two mutually perpendicular directions. (Knapp-USGS)
W70-08256

GOLD IN THE MODERN SEDIMENTS OF THE NORTHERN PART OF THE ATLANTIC OCEAN BASIN,
For primary bibliographic entry see Field 02K.
W70-08262

ECOLOGICAL SURVEYS FROM SPACE.
National Aeronautics and Space Administration, Washington, D.C. Office of Technology Utilization.
For primary bibliographic entry see Field 07B.
W70-08465

ESTUARINE RADIOECOLOGY - A BIBLIOGRAPHY OF REPORT LITERATURE,
Department of the Interior, Washington, D.C. Office of Library Services.
For primary bibliographic entry see Field 10.
W70-08470

DISTRIBUTION OF DOLOMITE IN A TIDAL FLAT ENVIRONMENT, SUGARLOAF KEY, FLORIDA,
Esso Production Research Co., Houston, Tex.
D. K. Atwood, and J. N. Bubb.
Journal of Geology, Vol 78, No 4, p 499-505, July 1970. 7 p, 2 fig, 1 tab, 7 ref.

Descriptors: *Dolomite, *Carbonate rocks, *Diagenesis, *Water chemistry, *Tidal marshes, Shallow water, Florida, Sampling, Salinity, Calcium, Magnesium, Sea water, Tides.
Identifiers: Tidal flats, Sugarloaf Key (Fla).

A study of modern tidal flats on Sugarloaf Key, Florida, has been made to determine distribution of penecontemporaneous dolomite, the presence of which was previously reported by Shinn. Dolomite occurs in a crust at or near the surface of Recent tidal flat sediments and in lesser amounts in unconsolidated sediments. The greatest concentration of dolomite is near the shoreline and within topographic lows on the flats, that is, areas where sediments are most frequently wet by tides. The dolomite concentration decreases toward interior and higher portions of the flats, and essentially no dolomite was found in adjacent bays. Interstitial waters expressed from Recent sediments on the flats were analyzed at different times in the year and found to be near sea water in salinity and chemistry. This combination of dolomite distribution and interstitial water data suggests that dolomitization is occurring with waters near sea water in composition. (Knapp-USGS)
W70-08483

SETTLING VELOCITY OF GRAINS OF QUARTZ AND OTHER MINERALS IN SEA WATER VERSUS PURE WATER,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02J.
W70-08484

DOSAGE REQUIREMENTS FOR SLUG INJECTIONS OF RHODAMINE BA AND WT DYES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W70-08498

A TEST OF FLUSHING PROCEDURES TO CONTROL SALT-WATER INTRUSION AT THE W. P. FRANKLIN DAM NEAR FT. MYERS, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 05G.
W70-08516

THE MAGNITUDE AND EXTENT OF SALT-WATER CONTAMINATION IN THE CALOOSAHATCHEE RIVER BETWEEN LA BELLE AND OLGA, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 05B.
W70-08517

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

INVESTIGATION OF THE FEASIBILITY OF PURIFYING MUNICIPAL WASTE WATER BY DISTILLATION,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05D.
W70-08431

A STUDY OF WATER PLANT ISOLATION FROM CONTAMINATION,
National Nuclear Corporation, Palo Alto, Calif.
Frederick E. Crever.
For sale by Superintendent of Documents, US Government Printing Office, Wash, DC, 20402 - Price $1.50. Office of Saline Water Research and Development Progress Report No 526, October 1969. 147 p, 16 fig, 37 tab, 15 ref, 3 append. OSW Contract No 14-01-0001-2192.

Descriptors: *Desalination processes, *Water pollution control, *Design, *Nuclear engineering, Nuclear reactors, Nuclear wastes, Radioactive wastes, Costs, Cost analysis, Systems analysis.
Identifiers: Contamination control.

Potential concentration of radioactive nuclides in the water plant brine, effluent, and product water were determined for dual purpose power generation and desalting plants using nuclear steam supply systems. The nuclear steam supply systems considered were those using the light water-cooled and moderated reactors. The direct cycle system using the boiling water reactor, and the pressur water reactor using the indirect cycle were considered. A design basis was studied for a p surized, demineralized water loop to be inse between the heating steam from a nuclear st supply and the brine in a multistage flash sea w desalting plant to allow extended operation at capacity with brine heater leakage. The loop i be pressurized to about 10 psi above both the h ing steam and the brine so that any leakage that curs in the heat exchangers would be either into nuclear steam supply system or into the water p brine. The leakage would be pure water, wh would not be harmful to either the steam sup system or the water plant. A design basis was studied for an isolating loop using steam as working fluid between a nuclear steam supply an multistage flash sea water distillation plant. W horizontal brine heaters, the steam temperatu would have to be raised to 273 deg F which wo give a steam pressure of 43.8 psia in order to ins steam pressure above brine pressure at all point potential leakage. (Knapp-USGS)
W70-08504

REPORT ON DIFFERENTIAL THERMAL A THERMOGRAVIMETRIC ANALYSIS,
Wrightsville Beach Test Facility, N.C.
John R. Newton, and M. E. Atkins.
For sale by the Superintendent of Documents, Government Printing Office, Wash, DC, 2040 Price $1.00. Office of Saline Water Research Development Progress Report No 514, Decem 1969. 99 p, 75 fig, 20 ref.

Descriptors: *Scaling, *Chemical analysis, *D ferential thermal analysis, *Gravimetric analy *Distillation, Desalination processes, X-ray ana sis.
Identifiers: Thermogravimetric analysis.

The need for analytical data pertaining to the co position of scales from distillation plants resulted an evaluation of differential thermal analy (DTA) and thermogravimetric analysis (TGA The data obtained by DTA-TGA can be easily terpreted. X-ray methods will qualitatively identi trace compounds which may not be detected DTA-TGA. X-ray and TGA methods provide qua titative results; however, TGA provides a more curate quantitation of major constituents with le time spent in interpretation and little, if any, sta dard analyses required. (Knapp-USGS)
W70-08507

THEORY OF LIQUIDS,
Waterloo Univ. (Ontario).
For primary bibliographic entry see Field 01A.
W70-08510

DEVELOPMENT OF MODIFIED POLYOLEFI MEMBRANES FOR REVERSE OSMOSIS,
Southwest Research Inst., San Antonio, Tex.
H. F. Hamil, and W. W. Harlowe, Jr.
For sale by Superintendent of Documents, U Government Printing Office, Wash, DC 20402 Price $0.65. US Office of Saline Water Researc and Development Progress Report No 530, Jun 1970. 58 p, 9 fig, 22 tab, 2 ref. OSW Contract N 14-01-0001-2129.

Descriptors: *Desalination processes, *Reverse o mosis, *Permselective membranes, *Plastic *Laboratory tests, Permeability, Ion transpo Semipermeable membranes.
Identifiers: Grafted polyethylene membranes.

Procedures were studied for the radiation-induce grafting of polyethylene film to yield a variety modified polyethylene membranes. Modification the polyethylene was accomplished by grafting wi acidic monomers such as aminoalkyl methacrylat and vinylpyridines, and neutral monomers such hydroxyalkyl methacrylates. Some graft te polymers were prepared by incorporating relative hydrophobic monomers such as acrylonitril

rylamide, or vinyl acetate into the grafting solution along with acrylic acid. Crosslinking during rafting was accomplished by use of difunctional ionomers in the grafting solution. The membranes produced maintained much of the tensile rength and elongation of the original olyethylene. The acid- and base-grafted films ere hydrophilic, particularly as the potassium and ydrochloride salts. The hydrophilicity of such embranes was reduced by crosslinking or by grafting with a hydrophobic monomer. The eutral membranes appeared to be relatively imermeable to water. (Knapp-USGS)
W70-08514

YNTHESIS OF MODIFIED LOEB MEMRANES BY GRAFTING,
olymer Research Corp. of America, Brooklyn, .Y.
arl Horowitz.
or sale by Superintendent of Documents, US overnment Printing Office, Wash, DC, 20402 - rice $0.50. US Office of Saline Water Research nd Development Progress Report No 545, June 970. 41 p, 1 fig, 16 tab. OSW Contract No 14-01-0001-1322.

Descriptors: *Desalination processes, *Reverse osmosis, *Permselective membranes, *Laboratory tests, *Permeability, Ion transport, Cellulose.
Identifiers: Grafted membranes, Loeb membranes, Cellulose acetate membranes.

A large number of monomers were grafted and chemically attached to the cellulose acetate molecules of Loeb membranes for reverse osmosis, with subsequent growth of polymeric side chains of the monomer. The grafting of nonpolar monomers gave no improvement in either water flux or salt rejection efficiency. Strongly polar monomers, especially positively charged quaternaries, substantially increased the water flux without loss in salt rejection efficiency. The polar charge of the grafted chains may orient the dipole molecule of water and increase its transport rate. Grafting on completely prepared membranes gave results that were reproducible and uniform, and permitted meaningful comparison with reference membranes. (Knapp-USGS)
W70-08515

3B. Water Yield Improvement

DEVELOPMENT AND EVALUATION OF WATER HARVESTING SYSTEMS,
Arizona Water Resources Research Center, Tucson.
Carwin B. Cluff, Gordon R. Dutt, Martin M. Fogel, and Lorne G. Wilson.
Available from the Clearinghouse as PB-192 763, $3.00 in paper copy, $0.65 in microfiche. Project Completion Report, December 1969. 28 p, 7 fig, 2 tab, 6 ref. OWRR Project A-001-ARIZ (6).

Descriptors: *Water Harvesting, *Water Yield Improvement, Water storage, Underground water storage, Water conservation, Waterproofing, Surface sealing, Stock water, *Evaluation, Recharge wells, Injection wells.

Water harvesting systems were developed and evaluated. These systems consisted of gravel covered plastic and sodium-treated catchments with plastic-lined, butyl-covered storage tanks and underground storage into unused aquifers through artificial recharge. A plastic-laying gravel spreader that attaches to a dump truck was developed and used to install a one-half acre gravel covered plastic catchment. The catchment supplies water to a 100,000-gallon capacity storage tank which is lined with 6-mil polyethylene plastic and covered with a butyl rubber cover. Field tests using sodium chloride were conducted on 8 X 16 and one acre plots. These tests indicate that the sodium chloride treatment does reduce the infiltration rate on sandy loam soils. The overall increase for the year following treatment was approximately 35 per cent. Field tests made using a recharge pit and a recharge well indicated that for small quantities of harvested, sediment free water, the recharge well would be recommended for injection into underground storage, substantial water quality changes could occur in percolating water when using the recharge pit. The same injection well could be used to recover the recharged waste. (Cluff-University of Arizona)
W70-08153

INFLUENCE OF CONTOUR TRENCHING ON SNOW ACCUMULATION,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
Robert D. Doty.
Journal of Soil and Water Conservation, Vol 25, No 3, p 102-104, May-June, 1970. 3 p, 6 fig, 1 tab, 2 ref.

Descriptors: *Snow management, *Water conservation, *Vegetation effects, *Contour furrows, *Trenches, Snow cover, Water yield improvement, Utah, Land management, Soil conservation.
Identifiers: Contour trenching.

Contour trenches for watershed rehabilitation in Utah were evaluated with regard to their effect on snow accumulation. The trenches studied are on a windswept southwest exposure where snow redistribution by wind is important. Trenches increased snow accumulation slightly, which appeared to be more significant to revegetation than to water yield. (Knapp-USGS)
W70-08185

SNOW HYDROLOGY OF THE PRAIRIE ENVIRONMENT,
Saskatchewan Univ., Saskatoon. Div. of Hydrology.
For primary bibliographic entry see Field 02C.
W70-08241

SNOW STORAGE DISTRIBUTION IN RIVER BASINS,
For primary bibliographic entry see Field 02C.
W70-08268

CONDENSATION AS A MECHANISM FOR WATER GAIN IN NOCTURNAL DESERT POIKILOTHERMS,
California Univ., Los Angeles Dept. of Zoology.
Robert C. Lasiewski, and George A. Bartholomew.
National Science Foundation research grants GB-5347 and 6B-5139. Copeia, No 2, p 405-407, August 31, 1968. 1 fig, 1 tab, 8 ref.

Descriptors: *Xerophilic animals, *Condensation, *Microenvironment, *Moisture availability, Relative humidity, Dew point, Animal physiology, Toads, Reptiles, Physiological ecology, Water balance, Arid lands.
Identifiers: *Poikilotherms, *Fossorial animals, Spiders.

Four nocturnal, fossorial, and poikilothermic desert-dwelling animals - a banded gecko, trantula, and two species of spadefoot toads - were cooled for 30 minutes at 15 deg centigrade and 90-100 percent relative humidity. Each was subsequently transferred to a weighing chamber at 30-32 deg centigrade and 85-92 percent relative humidity. Each animal gained weight as a result of water condensation on its body surfaces. The amount condensing varied directly with body size but bore no relation to body weight. Desert subsoil temperatures in the summer are fairly uniform and often greater than 30 deg centigrade. Humidity in the burrows may be quite high in contrast to the outside. The body temperature of a nocturnal poikilotherm moving about on the ground surface may drop 10-15 deg, creating the necessary conditions for condensation upon reentry into the warm, humid burrow. Whether such condensation could yield physiologically useful water cannot be answered in the absence of data on water turnover rates in desert poikilotherms. It is stressed that these experiments indicate that such condensation could occur in nature, but it is not implied that it actually does. (Casey-Arizona)
W70-08344

HYDROGEOLOGY OF THE UPPER SILVER BOW CREEK DRAINAGE AREA, MONTANA,
Montana Bureau of Mines and Geology, Butte.
For primary bibliographic entry see Field 02F.
W70-08463

DESIGN FLOOD DETERMINATION IN SOUTH AFRICA,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W70-08464

OBJECTIVES, METHODS, AND ENVIRONMENT--GILA RIVER PHREATOPHYTE PROJECT, GRAHAM COUNTY, ARIZONA,
Geological Survey, Washington, D.C.
R. C. Culler, D. E. Burkham, M. R. Collings, E. S. Davidson, and R. L. Laney.
For sale by Superintendent of Documents, US Government Printing Office, Washington, DC 20402. Price $0.45. US Geological Survey Professional Paper 655-A, 1970. 25 p, 10 fig, 29 ref.

Descriptors: *Hydrologic budget, *Evapotranspiration, *Phreatophytes, *Arizona, Energy budget, Water balance, Streamflow, Groundwater, Evaporation, Transpiration, Alluvial channels, Water supply, Water resources development, Water conservation.
Identifiers: Gila River Phreatophyte Project.

The most obvious need in phreatophyte-control research is evaluation of water conservation on a flood plain typical of many areas of existing and proposed application. Hydrologic and ecologic variables must be defined by the evaluation so that the data may be applied to other sites. A 24-kilometer (15-mile) reach of the Gila River flood plain in the San Carlos Indian Reservation was divided into three subreaches. About 2,400 hectares are covered by phreatophytes, principally saltcedar and mesquite. Phreatophyte removal was started in 1966. Postclearing measurement will extend to July 1972. A water budget includes surface and subsurface inflow and outflow in the Gila River and its tributary inflow to the reach, precipitation on the flood plain, and changes in groundwater storage in the saturated and unsaturated zones of the study reach. The vegetation, chemical quality of water, sedimentation, and climate also are being studied. The water budget is the basic method of evaluation. All data are being collected for analysis by digital computer. (Knapp-USGS)
W70-08467

PRECIPITATION, STREAMFLOW, AND MAJOR FLOODS AT SELECTED SITES IN THE GILA RIVER DRAINAGE BASIN ABOVE COOLIDGE DAM, ARIZONA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W70-08468

WINDS OVER SALTCEDAR,
Geological Survey, Lubbock, Tex.
For primary bibliographic entry see Field 02D.
W70-08469

FOREST HYDROLOGY RESEARCH IN WATERSHED MANAGEMENT,
Oregon State Univ., Corvallis. Dept. of Forest Hydrology and Watershed Management.
For primary bibliographic entry see Field 04D.
W70-08474

ENERGY BALANCE ESTIMATES OF EVAPOTRANSPIRATION,
Oregon State Univ., Corvallis. Dept. of Forest Climatology.
For primary bibliographic entry see Field 02D.
W70-08477

MAJOR UNITED STATES WATER PROBLEMS ALONG THE INTERNATIONAL BOUNDARY REACH OF THE RIO GRANDE (BRAVO),
International Boundary and Water Commission, El Paso, Tex. Office of Water Control.
Ted E. Henderson.
In: International Water Law Along the Mexican-American Border, Committee on Desert and Arid Zone Research, Southwestern and Rocky Mountain Division, A.A.A.S., No 11, p 26-36, 1968. 2 fig, 5 ref.

Descriptors: *Texas, *Rio Grande, *International Boundary and water commission, Water supply, Water control, Water quality, Dams, Flood control, Reservoirs.
Identifiers: *Mexico.

Since the water treaty of 1944 between the U.S. and Mexico, the major Rio Grande water problems in the U.S. have been: (1) Regulation and usage (2) Water quality (3) Water supply (4) Flood damage. The river flow is now largely regulated by dams and the remaining problems are only those of adjudicating Texas water rights and improving irrigation practices. In the areas of major usage, supply problems exist or are anticipated in the El Paso, Maverick and Lower Rio Grande areas where demands are rapidly increasing. The principle quality problem is salt accumulaton on both the American and Mexican sides, resulting from shortage of water for leaching salts. Although efforts are being made, a final solution will be achieved only by additional water from the outside. Water from desalinization will probably be a major factor sometime in the future. Current construction plans, when realized, will probably eliminate flood damage. (Casey-Arizona)
W70-08539

3C. Use of Water of Impaired Quality

RELATIONSHIPS BETWEEN CERTAIN INDICES OF SALINE WATER IRRIGATED SOILS OF WESTERN RAJASTHAN,
Central Arid Zone Research Iast., Jodhpur (India); and Indian Grassland and Fodder Research Inst., Jhansi (India). Div. of Soil Science and Agronomy.
For primary bibliographic entry see Field 02G.
W70-08347

PEANUT RESPONSE TO UNIFORM AND NON-UNIFORM SOIL SALINITY,
National and Univ. Inst. of Agriculture, Rehovoth (Israel). Volcani Inst. of Agriculture Research.
J. Shalhevet, P. Reiniger, and D. Shimshi.
Agronomy Journal, Vol 61, No 3, p 384-387, May-June 1969. 3 fig, 3 tab, 5 ref.

Descriptors: *Peanuts, *Saline soils, *Plant growth, *Crop response, *Crop production, Arid lands, Irrigation, Evapotranspiration, Adsorption, Germination, Growth stages, Seeds, Plant physiology, Salinity, Salt tolerance, Soil profiles.
Identifiers: *Soil salinity, *Water uptake, Israel.

Peanuts grown in artificially salinized plots showed a 50 percent yield reduction at an EC sub e of 4.7 mmhos/cm and a 20 percent reduction at an EC sub e of 3.8 mmhos/cm. As long as there was equal mean soil salinity, the shape of the soil salinity profile did not affect yield reduction. As salinity increased, total ET decreased, but it would appear that the reduction in water uptake resulting from increased soil salinity was the consequence of reduced growth, rather than the cause of it. The decrease in ET efficiency at high salinity levels was due not to transpiration, but to evaporation from plots having an incomplete plant cover. Salt tolerance was higher during germination than during any subsequent growth stage. At an EC sub e of 13 mmhos/cm a 50 percent reduction in germination was obtained. There was a similar 50 percent reduction in seedling development at an EC sub e of 7.2 mmhos/cm. (Carr-Arizona)
W70-08521

3D. Conservation in Domestic and Municipal Use

MCFEETERS V PARKER (ADMINISTRATIVE AGENCY'S CONTROL OVER PUBLIC UTILITIES).
30 A2d 300-305 (Vt 1943).

Descriptors: *Vermont, *Water supply, *Pipes, *Administrative agencies, Eminent domain, Judicial decisions, Legal aspects, Water demand, Conduits, Legislation, Public utilities, Public health, Water distribution (Applied), Consumptive use, Water conveyance, Distribution systems, Pumping plants, Public benefits.

Defendant operated a water system pursuant to plaintiff Public Service Commission sactions, serving the general area as a public utility. After supplying water for a number of years to plaintiff's property, defendant's supply to that property was terminated without the prior permission of the Commission. The Commission had later ordered defendant to furnish the property with a supply of water after finding that the continuance of the service was necessary for the safety, convenience and accomodation of the public. Defendant was also ordered to repair all pipelines and appliances necessary to bring a water supply to the property. Plaintiffs petitioned for a writ of mandamus to enforce these orders. Defendant answered by challenging the constitutional authority of the Commission. The court held that defendant's system had an adequate supply of water and that there would be no financial difficulty in restoring service to plaintiff's property. The court held further that the Commission's order was within its statutory and constitutional powers of general supervision over companies engaged in the sale and distribution of water for domestic purposes. (Barnett-Florida)
W70-08522

PETITION OF NEW YORK WATER SERVICE CORP (REVIEW OF ADMINISTRATIVE ORDER DENYING APPROVAL OF SHALLOW WELL CONSTRUCTION).
283 NY 23, 27 NE2d 221-225 (1940).

Descriptors: *New York, *Saline water intrusion, *Administrative decisions, *Shallow wells, Cities, Municipal water, Wells, Groundwater, Water consumption, Water supply, Water quality, Water pollution sources, Well regulations, Administrative agencies, Adjudication procedure, Judicial decisions, Legal aspects, Civil engineering, Water works, Urbanization, Water policy, Population, Chlorine, Well permits, Drawdown.

Petitioner was a private water company which was the sole supplier of water to a large part of Brooklyn. Due to the intrusion of chlorine, sand and salt into various underground sources, petitioner's daily yield from these sources had decreased over a period of years. In the same period population had gradually increased in the area petitioner served. Petitioner applied to defendent Water Power and Control Commission for approval of a plan to construct and temporarily operate four wells of shallow depth until a new source could be obtained from another water development project. The Commission denied the application on the grounds that public necessity did not justify use of new wells and that their construction could increase salt-water intrusion into the area. Petitioner appealed to the court for review. The court found that defendant's contentions did not rest on such adequate findings of fact as wo enable parties or a court to determine whether decision followed as a matter of law. Further, p tioner had not been allowed to cross-examine fendant's investigating engineer concerning conclusions. The court remanded the proceedi to the Commission with instructions to ma findings of fact. (Hubener-Florida)
W70-08563

CITY OF SPRINGDALE V FLEMING (R FORCEMENT OF CONTRACT TO SUPP WATER).
89 SW2d 602-603 (Ark 1936).

Descriptors: *Arkansas, *Easements, *Usufruct ry right, *Contracts, Cities, Pipes, Water co veyance, Water conservation, Water costs, Wa delivery, Water distribution (Applied), Wa supply, Drains, Reasonable use, Irrigation, Cavi tion, Consumptive use, Irrigation water, Domes water, Conduits, Judicial decisions, Legal aspec Springs.

Plaintiff contracted with and coveyed to defend city a tract of land upon which was located a spri Plaintiff also gave an easement over an additio tract he owned to allow defendant to lay wa mains. As consideration for these transfers, defe dant agreed to furnish plaintiff with free water domestic, yard and stock watering purposes. Pla tiff received free water until defendant disco nected the water supply, alleging plaintiff's abu of the privilege by using water for commercial, rigation, and purposes other than as comtemplat in the contract. Plaintiff brought action for a ma datory injunction to enforce the contract. Defe dant appealed from a lower court holding for plai tiff. On appeal, defendant alleged: (1) that the co tract was void since it failed to comply with an a plicable statute; and (2) that the right of the city acquire a water source and an easement to lay i water mains was ultra vires. The court held that was immaterial whether the water supply w acquired in conformity with the statute. Defenda could not retain the spring and easement witho continuing to pay the agreed upon consideratio which was the free use of water by plaintiff. (Ba nett-Florida)
W70-08564

NEW YORK WATER SERV CORP V WATE POWER AND CONTROL COMM'N OF DEP OF CONSERVATION OF NEW YORK (EXCES SIVE DELEGATION OF POWER TO DETER MINE NECESSITY FOR WELLS AS NO CREATING PROPERTY RIGHT).
256 App Div 80,9 NYS2d 299-301 (1939).

Descriptors: *New York, *Supervisory contro (Power), *Administrative dicisions, *Well permits Wells, Water supply, Potable water, Administrativ agencies, Administration, Legal aspects, Judicia decisions, Legislation, Water demand, Subsurfac waters, Well regulation, Water permits, Regula tion, Decision making, Institutional constraints Well spacing.
Identifiers: *Constitutional law.

Petitioner public water company was authorized b defendant Water Power and Control Commissio 'to sink as many wells as it may find to be necessar in order to obtain sufficient water to meet th needs of its customers.' Subsequently, withou notice, defendant rescinded the authorization. Pet tioner sought annulment of the recission order contending that such order destroyed propert rights created by the authorization. The appellat court held that, in allowing petitioner to determin the future necessity for additional wells, the Com mission had exceeded its statutory power. This wa so even though the authorization had been couple with the limitation that the Commission must ap prove all well locations. The authorization, there fore, being in excess of the Commission's power t grant, gave petitioner no right which partook of th aspect of property. Accordingly, when th

authorization was rescinded, there was no property right to take away. The recission, not being violative of the due process clause of the Federal Constitution, was affirmed. (Marsee-Florida)
W70-08581

3E. Conservation in Industry

INDUSTRIAL WATER RECIRCULATION IN NORTHEASTERN ILLINOIS,
Illinois State Water Survey, Naperville.
Robert T. Sasman.
Journal American Water Works Association, Vol 62, No 5, p 269-273, May 1970. 5 p, 4 fig, 2 tab.

Descriptors: *Water reuse, *Industrial water, *Reclaimed water, *Illinois, Surveys, Water costs, Water demand, Water supply.
Identifiers: Chicago (Ill).

A number of industries, commercial companies, and service organizations are participating in programs of water recirculation in northeastern Illinois. Chemical and metal processing industries are doing the most recirculating and food processors are doing very little. Sixteen systems reduced total pumpage an average of approximately 47 percent. Primary reasons presented for recirculating water included a concern for the availability of the water, the cost of water, and recent regulations regarding water quality standards for surface waters receiving waste water effluent. (Knapp-USGS)
W70-08228

EFFECT OF MUNICIPAL WATER SERVICE POLICIES ON ECONOMIC GROWTH IN SUBURBAN AREAS,
Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
For primary bibliographic entry see Field 06B.
W70-08420

3F. Conservation in Agriculture

EFFECT OF ANTECEDENT SOIL WATER ON PRESEASON RAINFALL STORAGE IN A SLOWLY PERMEABLE IRRIGATED SOIL,
Agricultural Research Service, Bushland, Tex. Southwestern Great Plains Research Center.
For primary bibliographic entry see Field 02G.
W70-08184

CLIMATIC ESTIMATES OF AVERAGE AND PROBABLE IRRIGATION REQUIREMENTS AND OF SEASONAL DRAINAGE IN CANADA,
Department of Agriculture, Ottawa (Ontario). Plant Research Inst.
W. Baier, and George W. Robertson.
Journal of Hydrology, Vol 10, No 1, p 20-37, Jan 1970. 18 p, 7 fig, 7 tab, 21 ref.

Descriptors: *Water demand, *Water requirements, *Irrigation water, *Hydrologic budget, Water balance, Climatology, Evapotranspiration, Precipitation (Atmospheric), Rainfall, Water allocation (Policy), Water management (Applied), Water distribution (Applied).
Identifiers: *Canada.

The use of published information to calculate average and probable irrigation requirements by means of a meteorological budgeting technique from 30-year daily climatic records is presented. This information, available for 59 stations across Canada, is useful for planning irrigation systems and interpretations of climate in terms of agricultural water needs and surplus. A seasonal drainage estimator model requiring as input only monthly values of precipitation and potential evapotranspiration was developed from the data for 42 stations and verified on the data for another 17 stations. An irrigation water balance is presented for 11 selected stations across Canada. (Knapp-USGS)
W70-08216

INFLUENCE OF IRRIGATION INTERVAL AND PLANT DENSITY OF ALFALFA SEED PRODUCTION,
American Univ., Beirut (Lebanon). Faculty of Agricultural Sciences.
S. Abu-Shakra, M. Akhtar, and D. W. Bray.
Agronomy Journal, Vol 61, No 4, p 569-571, July-August 1969. 1 tab, 6 ref.

Descriptors: *Irrigation effects, *Alfalfa, *Seeds, *Crop production, *Crop response, Irrigation, Irrigation practices, Environmental effects, Density, Spatial distribution, Semiarid climates.
Identifiers: *Irrigation interval, *Plant density, *Hard seeds, *Lebanon, Pods, Yield components.

Alfalfa was grown in 1966 and 1967 on the Beqa'a Plain of Lebanon in order to study the influence of certain variables on seed production. Plants were irrigated in intervals varying from 1 to 4 weeks and within-row spacings were 25, 50, or 75 cm. The optimum irrigation interval appeared to be once every two weeks for a seasonal water total of 25.7 cm. Such an irrigation frequency produced the highest seed yield and generally increased 1,000-seed weight, number of seeds per pod, and number of pods per raceme. The greatest number of hard seeds came from plants irrigated at 3 or 4-week intervals. The 50-cm plant spacing produced alfalfa with the highest yield per plot. 'African,' 'Chilean,' and 'Hairy Peruvian' varieties of alfalfa were used in the experiment. 'Hairy Peruvian' was the shortest of the three varieties, but produced more seeds per pod and more pods per raceme. (Carr-Arizona)
W70-08341

MOISTURE AND TEMPERATURE EFFECTS ON EMERGENCE AND INITIAL GROWTH OF TWO RANGE GRASSES,
Agricultural Research Service. Crops Research Div.; and New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 02I.
W70-08342

IRRIGATED WHEAT ON A CALCAREOUS SOIL AS AFFECTED BY APPLICATION OF NITROGEN, PHOSPHORUS, POTASSIUM, AND ZINC: I. YIELD, COMPOSITION, AND NUMBER OF HEADS,
American Univ., Beirut (Lebanon). Faculty of Agricultural Sciences.
H. D. Fuehring.
Agronomy Journal, Vol 61, No 4, p 591-594, July-August 1969. 4 tab, 8 ref.

Descriptors: *Wheat, *Irrigated land, *Calcareous soils, *Fertilizers, *Crop response, Nutrients, Nutrient requirements, Essential nutrients, Deficient elements, Arid lands, Semiarid climates, Irrigation, Supplemental irrigation, Crop production, Cereal crops, Grains (Crops), Nitrogen, Phosphorus, Potassium, Calcium carbonate, Rates of application.
Identifiers: *Lebanon, *Zinc, First order effects, Heads.

A Mexican semi-dwarf wheat, 'Pitic 62,' was grown under irrigation on the calcareous soil of the Beqa'a Plain in Lebanon. Since the soils of this arid and semiarid region lacked sufficient N and P for irrigated crops, experiments were conducted with applications of N, P, K, and Zn. N applications increased grain yield up to 9 metric tons/ha, but at current prices the most economic application rate was 300 kg/ha for a yield of 6 to 8 metric tons/ha. P and Zn tended to reduce grain yield when they were applied. This was apparently due to overstimulation of tillering, which at the normal seeding rate resulted in an excessive number of heads per unit area. Such an increase in tillering may be important if expensive hybrid wheat seeds make it desirable to use low seeding rates. Fertilization with each variable increased its own concentration in the grain. While significant negative first order effects were shown by N on P concentration and by K on Cu concentration, significant positive first order effects were shown by N on Ca concentration and by P on K concentration. Two- and three-way interactions considerably modified some of these first order effects. (Carr-Arizona)
W70-08343

SUMMER FALLOW FOR DRYLAND WINTER WHEAT IN THE SEMIARID GREAT PLAINS,
Agricultural Research Service. Northern Plains Branch; and Nebraska Univ., North Platte. Agricultural Experiment Station.
D. E. Smika.
Agronomy Journal, Vol 62, No 1, p 15-17, January-February 1970. 3 tab, 8 ref.

Descriptors: *Wheat, *Dry farming, *Fallowing, *Crop response, *Great Plains, Semiarid climates, Nebraska, Grains (Crops), Cereal crops, Rotation, Precipitation (Atmospheric), Rainfall, Soil moisture, Soil water, Water management (Applied), Water utilization, Stubble mulching, Crop production, Limiting factors, Fertilizers, Nitrogen.
Identifiers: *Winter wheat, *Water-use efficiency, Crop failure, Nitrogen content.

Continuously cropped wheat was compared with summer-fallowed wheat under semiarid conditions and the fallowed wheat was found to have three times the average yield of the continuous wheat. Not only were there no crop failures recorded for the fallow-wheat during the 27-year study, but fallow-wheat also demonstrated up to 80% greater water-use efficiency than continuous wheat at 43 cm annual precipitation or below. In comparison, continuous wheat failed more than 30% of the time and attained equal water-use efficiency at 58 cm or above only with application of N fertilizer. Continuous wheat required N fertilizer in order to obtain maximum yield, water-use efficiency, and N content. Fallow-wheat, however, contained as much N without fertilization as continuous wheat with fertilization and fertilized continuous wheat used water only 71% as efficiently as unfertilized fallow-wheat. It appears that the summer fallow system is superior to continuous wheat production under semiarid conditions. (Carr - Arizona)
W70-08350

EVAPORATION AND CONDENSATION ON BARE SOIL UNDER IRRIGATION IN THE EAST CENTRAL GREAT PLAINS,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
For primary bibliographic entry see Field 02D.
W70-08352

DRAINAGE AND SALINITY,
Department of Agriculture, Lethbridge (Alberta). Research Station.
J. C. Van Schaik, T. G. Sommerfeldt, and E. Rapp.
Canada Agriculture, Vol 15, No 2, Spring 1970, p. 9-11. 6 fig.

Descriptors: *Irrigation effects, Water tables, Saturated soils, *Salinity, *Tile drains, Canal linings, *Drainage, Irrigation canals, Drainage systems.
Identifiers: Alberta.

Although irrigation projects in the semiarid regions of Western Canada have been beneficial to land reclamation and increased crop production, improper drainage and high soil salt contents have led to waterlogging and salt accumulation. In order to combat these problems the Canadian Department of Agriculture has been experimenting with closely spaced tile drains for subsurface salt drainage and the emplacement of plastic or concrete liners on the bottoms of irrigation canals to water seepage into areas adjacent to the canals. (Holmes-Rutgers)
W70-08359

ULTIMATE SLUDGE DISPOSAL AND SOIL IMPROVEMENT,
Forest Service (USDA), Washington, D.C.
For primary bibliographic entry see Field 05E.
W70-08405

PROMOTING AGRICULTURAL DEVELOPMENT,
International Bank for Reconstruction and Development, Washington, D.C.
For primary bibliographic entry see Field 06B.
W70-08427

SOIL WATER USE FROM AN APPLE ORCHARD UNDER VARIOUS SOIL MANAGEMENT SYSTEMS,
Department of Agriculture, Ferntree Gully, (Victoria). Scores by Horticultural Research Station.
J. D. F. Black, and P. D. Mitchell.
Australian Journal of Experimental Agriculture and Animal Husbandry, April 1970, Volume 10, number 43, p. 209-213, 16 references, 2 fig, 4 tables.

Descriptors: *Water loss, Soil moisture, Wilting point, Nuclear meters, Microclimatology, Crop responses, Soil-water-plant relationships.
Identifiers: *Southern Victoria, Paraffin-cadmium technique.

Four soil management systems for growing mature apple trees were tested to determine the comparative amount of water lost during spring and summer. There were no appreciable differences found for total water losses between the four management practices: pasture, pasture with herbicide treatment, trashy cultivation (i.e. spring cultivation followed by summer and autumn weed growth), and clean cultivation (i.e. weeded). However, the apple trees under trashy cultivation lost slightly more water than the others during summer, while the trees grown on pasture lands without herbicide treatment lost more water during spring. (Holmes-Rutgers)
W70-08428

ECONOMIC GUIDELINES FOR LAND AND WATER RESOURCE USE IN AGRICULTURE,
Alberta Univ., Edmonton. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 06D.
W70-08432

THE RAFT RIVER BASIN, IDAHO-UTAH, AS OF 1966: A REAPPRAISAL OF THE WATER RESOURCES AND EFFECTS OF GROUNDWATER DEVELOPMENT,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 04B.
W70-08466

THE ARIZONA WATER CONTROVERSY: AN ECONOMIST'S VIEW,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 06B.
W70-08532

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

A METHOD FOR PREDICTING POLLUTANT TRANSPORT IN TIDAL WATERS,
California Univ., Berkeley. Hydraulic Lab.
For primary bibliographic entry see Field 05B.
W70-08168

SALVI V JOHN A MANNING PAPER CO (NEGLIGENT MAINTENANCE OF A DIKE).

168 Misc 661, 7 NYS2d 36-42 (Sup Ct 1938).

Descriptors: *New York, *Dikes, *Riparian rights, Adjudication procedure, Boundaries (Property), Contracts, Judicial decisions, Legal aspects, Natural flow doctrine, Relative rights, Riparian land, Riparian waters, Remedies, Damages, Dam failure, Floods, Maintenance, Usufructuary right, Flooding, Flood damage.
Identifiers: *Negligence, *Affirmative covenants, *Dam maintenance.

Defendants owned a dike which had fallen into disrepair through neglect. Consequently the creek which the dike had impounded flooded plaintiff's land. Plaintiff contended that defendants were bound by an affirmative covenant in a deed which their predecessor in title had negotiated to keep the dike in repair. Plaintiff sought the enforcement of this covenant and damages for defendants' negligent maintenance of the dike. The court held that an affirmative covenant is personal, not real, and as such it will not run with the land. Consequently, plaintiff could not seek enforcement of such covenant. The court held further, however, that notwithstanding the existence of an affirmative covenant to repair, responsibility for damages caused by negligent maintenance of a dam is generally imposed on the owner of the structure. Plaintiff's complaint sufficiently alleged such negligence on the part of defendants. Defendants' motion to dismiss the complaint as a whole was denied. (Clarke-Florida)
W70-08180

FLOOD PLAIN INFORMATION, SUSQUEHANNA AND CHENANGO RIVERS (TRIPLE CITIES AREA), BROOME COUNTY, NEW YORK.
Corps of Engineers, Baltimore, Md.

US Army Corps of Engineers Flood Plain Report, December 1969. 57 p, 4 fig, 23 plate, 17 tab.

Descriptors: *Floods, *Flood damage, *New York, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood.
Identifiers: Broome County (N Y), Susquehanna River (N Y), Chenango River (N Y), Standard project flood, Intermediate regional flood.

Flooding of the Susquehanna and Chenango Rivers, Broome County, New York is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W70-08196

CRITICAL EVALUATION OF CERTAIN METHODS OF UNSTEADY GROUNDWATER HYDRAULICS,
Wisconsin Univ., Milwaukee; and Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W70-08230

FLOOD PLAIN INFORMATION, RIDLEY CREEK, DELAWARE COUNTY, PENNSYLVANIA.
Corps of Engineers, Philadelphia, Pa.

US Army Corps of Engineers Flood Plain Report, April 1970. 53 p, 10 fig, 15 plate, 10 tab.

Descriptors: *Floods, *Flood damage, *Pennsylvania, Flood plains, Historic flood, Flood forecasting, Regional flood, Design flood.
Identifiers: *Ridley Creek, *Delaware County (Pa), Standard project flood, Intermediate regional flood.

Flooding of Ridley Creek in Delaware Coun Pennsylvania, from its confluence with t Delaware River at Chester, Pennylvania, upstrea to the Delaware-Chester County Line is describ to aid in solving local flood problems and p planning the best utilization of flood-prone lan Maps, profiles, cross sections, and test mater relating the extent of past flooding to floods whi might occur in the future are based on availab records of rainfall, runoff, historical flood heigh and other technical data. (Woodard-USGS)
W70-08235

FLOOD PLAIN INFORMATION, CROOKED CREEK AND TRIBUTARIES, HARRISON, AR KANSAS.
Corps of Engineers, Little Rock, Ark.

US Army Corps of Engineers Flood Plain Repor February 1970. 36 p, 18 fig, 16 plate, 10 tab.

Descriptors: *Floods, *Flood damage, *Arkansa Flood plains, Historic flood, Flood forecasting, Re gional flood, Design flood.
Identifiers: *Crooked Creek, *Harrison (Ark).

Flooding in and near Harrison, Arkansas alon Crooked Creek is described to aid in solving loca flood problems and in planning the best utilizatio of flood-prone lands. Maps, profiles, cross section and test material relating the extent of past floodin to floods which might occur in the future are base on available records of rainfall, runoff, historica flood heights, and other technical data. (Woodard USGS)
W70-08238

THIRD BUCKINGHAM COMMUNITY, INC V ANDERSON (COLLECTION AND DISCHARGE OF SURFACE WATER ONTO ADJOINING LAND).

178 Va 478, 17 SE2d 433-437 (1941).

Descriptors: *Virginia, *Drainage systems, *Sur face runoff, *Riddance (Legal aspects), Drainage water, Surface drainage, Repulsion (Legal aspects), Surface waters, Floods, Artificial water courses, Storm drains, Tiles, Subsurface drainage, Land tenure, Real property, Damages, Flood damage, Judicial decisions, Legal aspects, Relative rights.

Plaintiff and defendant were adjoining landowners. Plaintiff devoted his land to raising various marketable crops. Defendant erected apartment houses and a drainage system on his land. The drainage system collected all the drainage water on defendant's land and discharged it with great force and volume through a single large pipe onto plaintiff's land causing serious flooding and the accumulation of debris. Plaintiff sued for damages. In holding for plaintiff, the court acknowledged that the common law rule enabling a landowner to protect himself from surface waters prevailed in Virginia. However, the privilege could not be exercised wantonly or unnecessarily, and a landowner could not use his property so as to injure the rights of another. Thus, a landowner could not collect surface water into an artificial channel and cast it in greatly increased or unnatural quantities upon his neighbor's land even if the quantity was no greater than what would have been received in a more dispersed manner. (Hubener-Florida)
W70-08239

FLOOD PLAIN INFORMATION, PORTNEUF RIVER AND TRIBUTARIES NEAR POCATELLO, IDAHO AND VICINITY.
Corps of Engineers, Walla Walla, Wash.

US Army Corps of Engineers Flood Plain Report, March 1970. 48 p, 13 fig, 22 plate, 2 tab.

Descriptors: *Floods, *Flood damage, *Idaho, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood.

Identifiers: Pocatello (Idaho), Standard project flood, Intermediate regional flood.

Flooding of the Portneuf River, Pocatello, Idaho and vicinity is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W70-08245

FLOOD PLAIN INFORMATION, TRANQUITAS, SANTA GERTRUDIS AND ESCONDIDO CREEKS, KINGSVILLE, TEXAS.
Corps of Engineers, Galveston, Tex.

US Army Corps of Engineers Flood Plain Report, April 1970. 36 p, 5 fig, 17 plate, 9 tab.

Descriptors: *Floods, *Flood damage, *Texas, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood.
Identifiers: *Kingsville (Tex), Standard project flood, Intermediate regional flood.

Flooding of the Kingsville area, Texas is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W70-08246

FLOOD PLAIN INFORMATION, FLOYDS FORK, JEFFERSON COUNTY, KENTUCKY.
Corps of Engineers, Louisville, Ky.

U S Army Corps of Engineers Flood Plain Report, May 1969. 30 p, 5 fig, 11 plate, 9 tab.

Descriptors: *Floods, *Flood damage, *Kentucky, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood.
Identifiers: Jefferson County (Ky), Louisville (Ky), Standard project flood, Intermediate regional flood.

Flooding of Floyds Fork, Jefferson County, Kentucky is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W70-08260

FUNDAMENTAL PRINCIPLES OF THE METHOD FOR COMPUTING MAXIMUM RUNOFF,
For primary bibliographic entry see Field 02E.
W70-08271

FLOOD PLAIN INFORMATION, POND CREEK, JEFFERSON COUNTY, KENTUCKY.
Corps of Engineers, Louisville, Ky.

US Army Corps of Engineers Flood Plain Report, November 1968. 35 p, 5 fig, 10 plate, 10 tab.

Descriptors: *Floods, *Flood damage, *Kentucky, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood.
Identifiers: Jefferson County (Ky), Louisville (Ky), Standard project flood, Intermediate regional flood.

Flooding of Pond Creek, Jefferson County, Kentucky is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W70-08281

O'BARR V DUNCAN (RIGHT TO MAINTAIN DAM).

2 SE2d 82-83 (Ga 1939).

Descriptors: *Georgia, *Dams, *Obstruction to flow, *Easements, Streams, Surface waters, Running waters, Shallow waters, Earth dams, Barriers, Damsites, Land use, Real property, Farm management, Legal aspects, Judicial decisions, Riparian rights, Maintenance, Water levels, Relative rights.
Identifiers: *Fords.

Plaintiff upstream property owners sought an injunction against defendant downstream riparian owner to prohibit the maintenance of a dam on the stream which ran through their properties. Plaintiffs contended that they were prohibited from full use of their peoperty by the fact that defendant's dam caused the stream water to back up so as to interfere with a ford used by the plaintiffs. Defendant admitted maintaining the dam but claimed that his predecessors in title had also done so and that his dam was no different than the earlier one. Defendant claimed that an easement for the maintainance of the dam was reserved by his grantors and that non-use of such easement did not constitute abandonment as argued by plaintiff. In affirming the trial court's decision for the defendant, the Supreme Court of Georgia ruled that non-use did not mean abandonment of an easement and that the reservation of an easement was equivalent to an express grant of one. The court held that the evidence established that defendant did in fact have such an easement for maintaining a dam. (Barker-Florida)
W70-08289

FRADY V CAROLINA MOUNTAIN POWER CORP (LIABILITY FOR FLOOD DAMAGE DUE TO OPENING FLOODGATES).

196 SE 817-818 (NC 1938).

Descriptors: *North Carolina, *Dams, *Overflow, *Floodgates, Upstream, Streams, Damages, Lakes, Water injury, Flooding, Floodwater, Streamflow, Judicial decisions, Legal aspects, Rain, Rainfall, Rain water, Water storage, Standards, Regulation, Precipitation excess, Flood damage.

Defendant power company operated a dam about eight miles upstream from plaintiff's land. Rain water gradually accumulated in a lake above the dam until such water was overflowing a portion of the dam. In order to release the impounded water from the lake, defendant opened the flood gates of the dam, thereby releasing great volumes of water from the lake and into a stream below, which was already in a swollen condition. As a result of this increased amount of water, the stream overflowed onto plaintiff's land, causing damages to the land and the crops thereon. Plaintiff instituted proceedings to recover damages due to defendant's negligent operation of the dam. In a per curiam opinion, the appellate court affirmed the lower court's judgement for plaintiff. (Finman-Florida)
W70-08299

HASKELL V STATE (IMPROPER CONTROL OF CANAL FLOODGATE).
283 NY 612, 28 NE2d 27-28 (1940).

Descriptors: *New York, *Flood damage, *Floodgates, *New York State Barge Canal, Canal design, Canal construction, Design flow, Gates, Transportation, Engineering structures, Overflow, Control structures, Real estate, Flood control, Damages, Judicial decisions, Legal aspects, State government.

Plaintiff, as executrix of claimant's estate, brought action to recover for damages to claimant's lands, seawall, and shrubbery which was caused by flood waters from the lake on which the lands bordered. The lake constituted part of a barge canal system. Plaintiff contended that a floodgate and guard gate constructed and operated by the state to control an outlet from the lake were of inadequate size to exercise flood control. Furthermore, plaintiff alleged that the outlet gates had been closed when they should have been opened to permit the flow of water. The court, in a per curiam decision, affirmed the trial court's judgement for plaintiff. (Hubener-Florida)
W70-08331

UNION DRAINAGE DIST NO 5 V HAMILTON (ASSESSMENT AGAINST PROPERTY HOLDER FOR DRAINAGE IMPROVEMENT).
390 Ill 487, 61 NE2d 343-348 (1945).

Descriptors: *Illinois, *Drainage systems, *Tile drains, *Repairing, Drainage districts, Drainage, Surface drainage, Drainage programs, Surface waters, Controlled drainage, Culverts, Surface runoff, Diversion, Natural flow doctrine, Ditches, Drains, Diversion structures, Legislation, Legal aspects, Judicial decisions, Federal government, Roads, Outlets, Administrative agencies, Adjudication procedure.

Plaintiff drainage district sought confirmation of an assessment against defendant for repairs of a tile drainage system. The network had been built by the W.P.A., and plaintiff contended that the repairs were necessary to bring the system up to the level of efficiency contemplated by the original plans. Defendant argued that the network of drainage ditches was functioning properly and that the plaintiffs were attempting to discredit the reputation of the drainage district commission which had supervised the original construction. Defendant had been a member of that commission. Defendant further argued: that the proposed improvements would constitute an unlawful diversion of surface waters over his land, that the improvements would become clogged with quicksand in the same manner as the old, and that plaintiff had failed to show that sufficient outlets for the drainage were included in the plans. In affirming the trial court's judgment for plaintiff, the Supreme Court of Illinois held that defendant's objections were properly submitted to the jury and that the verdict was within the range of testimony offered at trial. (Barker-Florida)
W70-08339

DRAINAGE AND SALINITY,
Department of Agriculture, Lethbridge (Alberta). Research Station.
For primary bibliographic entry see Field 03F.
W70-08359

FRAZIER V VILLAGE OF WESTERVILLE (LIABILITY FOR FLOOD DAMAGES CAUSED BY DAM).

36 NE2d 812-819 (Ohio Ct App 1941).

Descriptors: *Ohio, *Damages, *Cities, *Obstruction to flow, Dams, Ditches, Drains, Pipes, Tile drainage, Drainage engineering, Judicial decisions, Legal aspects, Overflow, Flood damage, Rain water, Riparian rights, Streams, Water works, Banks, Dikes, Retaining walls, Relative rights.

Plaintiffs and defendant village owned land bordering a stream. Defendant constructed a permanent concrete dam and dikes across the stream for the improvement of its waterworks which subsequently caused the stream to overflow plaintiffs' land. Plaintiffs brought suit for damages. Defendant contended that the flood was due to an act of God as a result of excess rainfall, and consequently the flooding was entirely beyond its control. Also defendant contended that plaintiffs were not the owners of the property at the time the improvements were made, thus the cause of action did not inure to them but rather inured to plaintiffs' grantors. The court found no evidence to support the defence of an act of God in the high water and flood conditions were not so unusual or unexpected as to be unforseen by defendant when constructing the improvements. The court found that construction of the improvements was no completed until after plaintiffs had acquired their land, so plaintiffs did have a cause of action for damages. In holding for plaintiffs, the court found the measure of damages to be the difference between the value of the property before the injury and the market value of it after the injury. (Barnett-Florida)
W70-08382

STOER V OCALA MFG ICE AND PACKING CO (RIGHTS AND OBLIGATIONS OF LOWER RIPARIAN OWNERS).
24 So 2d 579-581 (Fla 1946).

Descriptors: *Florida, *Alteration of flow, *Natural flow doctrine, *Surface waters, Obstruction to flow, Surface drainage, Natural flow, Riparian land, Relative rights, Agriculture, Cultivated lands, Carrying capacity, Drainage practices, Irrigation canals, Irrigation ditches, Dams, Dikes, Bridges, Drainage districts, Watercourses (Legal), Natural streams, Riparian rights, Diversion structures, Legal aspects, Judicial decisions.

Plaintiff, a lower riparian landowner, sought to enjoin defendant corporation from alternately storing and releasing surface water through the use of wells, dams, culverts, gate valves, ditches, and dikes. Plaintiff contended that defendant's actions altered the natural flow of the river and caused inundation and damage to his property. Defendant contended that the damage was a result of the plaintiff's having built fences, low bridges, and foot logs over the river bed causing hyacinths and drift to collect and retard the flow and carrying capacity of the river. The court acknowledged as settled law that an upper proprietor may drain surface water from his lands into a natural watercourse, but is not permitted to collect and impound quantities of water and discharge it into a natural watercourse in such a way as to overtax it and inundate lands of a lower proprietor. However, plaintiff was in a cooperative drainage area and had a duty to keep his waterways open. Plaintiff had been negligent, and therefore was not entitled to relief. (Price-Florida)
W70-08426

MILLER V ERVIN (DAMAGES RESULTING FROM DRAINAGE DITCH CONSTRUCTION).
6 So 2d 910-914 (Miss 1942).

Descriptors: *Mississippi, *Ditches, *Railroads, *Right-of-way, Civil engineering, Transportation, Drainage, Excavation, Water conveyance, Surface waters, Damages, Overflow, Flooding, Construction, Grading, Landfills, Construction costs, Costs, Alternative costs, Comparative costs, Total costs, Absorption, Judicial decisions, Legal aspects.

Plaintiff land owner brought suit against defendants, receivers of a railroad, for damages to her land which resulted from overflow from a pond. The damages allegedly occurred when defendants dug a ditch on the railroad right-of-way. Plaintiff claimed that the ditch increased the velocity of accumulation in the pond which resulted in its overflowing and that prior to the digging of the ditch, a great deal of the surface water had been absorbed by the roadbed. Defendants argued that the ditch excavation was a reasonable use of their right-of-way and that no other method of improving the railroad's operation could have been employed as efficiently or cheaply as getting the needed fill from a ditch. The Supreme Court of Mississippi ruled that the railroad would only be held liable for damages caused by the resulting overflow if it could be shown that another method of securing fill for its roadbed would have been equally safe, convenient, and inexpensive as the one used. The trial court's judgment for the defendants was affirmed. (Barker-Florida)
W70-08442

DADE COUNTY V SOUTH DADE FARMS, INC (INJUNCTION AGAINST REMOVAL OF DAM).
182 So 858-862 (Fla 1938).

Descriptors: *Florida, *Dams, *Drainage, *Natural flow, Natural flow doctrine, Alteration of flow, Diversion, Surface waters, Obstruction to flow, Right of way, Local governments, Legal aspects, Surface drainage, Drainage systems, Diversion structures, Ditches, Culverts, Laterals, Dikes, Judicial decisions, Relative rights, Drainage density.

Plaintiff agricultural corporation sought an injunction against defendant county to prohibit removal of a dam built by plaintiff. Defendant had constructed a road on its right of way through plaintiff's land and had provided culverts beneath the road for drainage. Plaintiff claimed that the drainage system had gathered surface waters at an increased rate and had diverted the water onto his land causing unnatural flooding. To alleviate this flooding plaintiff dammed the culvert and opened a ditch to provide for less harmful drainage. Defendant argued that building the dam was unauthorized and had caused damage, expense, and inconvenience to them. Defendant further claimed that plaintiff infringed on its sole right to control drainage on the site. In affirming the trial court's granting of plaintiff's injunction, the Supreme Court of Florida ruled that no person has the right to gather surface waters, divert them from their natural flow and cast them on the land of another. The court also found that as a result of plaintiff's dam, the land enjoyed better drainage than before the dam. (Barker-Florida)
W70-08443

OPTIMIZATION OF THE STREAM FLOW REGULATION BY THE HYDROELECTRIC STATIONS RESERVOIRS WITH THE HELP OF MATHEMATICAL MODELS,
Akademiya Nauk SSSR.
L. S. Belyaev, and Y. P. Syrov.
13th Congress International Association Hydraulic Research, Proceedings, Vol 1, p 17-23, Aug-Sept 1969. 7 p, 12 ref.

Descriptors: *Reservoir operation, *Mathematical models, Reservoir storage, Scheduling, Streamflow, Optimization, Calculations, Foreign research, Hydroelectric plants, Hydroelectric power, Digital computers, Analytical techniques, Algorithm, Water resources, Electric power demand, Planning, *River regulation.
Identifiers: Hydroelectric resources, USSR, *Analytical method, *Hydrologic models, *Streamflow regulation.

Mathematical models and optimization methods for yearly and multiple-year flow regulation of hydroelectric station reservoirs of power and water resource systems are given. Different qualitites of initial information lead to corresponding mathematical models and methods. Because strict probabilistic methods are extremely difficult, approximate methods for annual operation of system r numerous hydropower stations are proposed. methods are based on probabilistic and de ministic calculations of flow regulation. De ministic calculations can be used with the grad method and the Pontryagin maximum princi The dispatch scheduling of multiple-year sto needs special game theory and statistic decisi criteria because of uncertain initial information choice solution to the most reasonable operatio power systems with several stations on multi year storage is presented. (USBR)
W70-08454

HOLLEY V LOUISIANA RY AND NAVIGATI CO (FLOOD DAMAGES FROM INADEQUA DRAINAGE CULVERT).

165 So 703-708 (La 1936).

Descriptors: *Louisiana, *Culverts, *Draina *Flooding, Damages, Overflow, Floods, Flo damage, Storms, Conduits, Conveyance structur Engineering structures, Drains, Surface draina Surface waters, Railroads, Rain, Cloudbursts, Ra fall intensity, Runoff, Weather patterns, Precipi tion intensity, Judicial decisions, Legal aspects.

Plaintiff land owners sought to recover dama from defendant railroad which resulted from flo ing caused by the inability of defendant's culvert carry off accumulated water. Defendant had co structed the culvert as a replacement for a trest Plaintiffs alleged that while the trestle had existe their land was not subject to overflow from rainf and that the culvert was inadequate to provide no mal flow. Defendant argued that the rainfall whi caused the flooding was phenomenal in amou and that the culvert was of equal capacity as t channel below it so that the flooding would ha occurred regardless of the culvert. Expert and l testimony presented by both parties was greatly conflict. In reversing the trial court's verdict for t plaintiffs, the Supreme Court of Louisiana rule that since the culvert was capable of carrying a the water which could have been drained by th lower channel, the damage caused to plaintiff crops and land was the result of phenomenal rai not the replacement of the trestle by defendant (Barker-Florida)
W70-08471

FLOOD PLAIN INFORMATION, QUINNIPIA RIVER, SOUTHINGTON, CONNECTICUT.
Corps of Engineers, Waltham, Mass.

US Army Corps of Engineers Flood Plain Report January 1970. 39 p, 20 photo, 9 plate.

Descriptors: *Floods, *Flood damage, *Connec ticut, Flood plains, Historic flood, Flood forecast ing, Regional flood, Design flood.
Identifiers: *Quinnipiac River, *Southingto (Conn).

Flooding of the Quinnipiac River in Southington Connecticut is described to aid in solving loca flood problems and in planning the best utilizatio of flood-prone lands. Maps, profiles cross sections and text material relating the extent of past flood ing to floods which might occur in the future ar based on available records of rainfall, runoff historical flood heights and other technical data (Woodard-USGS)
W70-08482

MCCUTCHEN V VILLAGE OF PEEKSKILL (RIGHT TO DISCHARGE SURFACE WATER INTO NATURAL WATERCOURSE.

167 Misc 460, 3 NYS2d 277-280 (Sup Ct 1938).

Descriptors: *New York, *Surface drainage, *Su face run-off, *Riparian rights, Land drainage Natural streams, Ditches, Aqueducts, Bridges Drainage effects, Drainage water, Surface wate

Overland flow, Precipitation excess, Obstruction to flow, Relative rights, Sewers, Drainage systems, Cities, Overflow, Flooding, Flood damage, Flow augmentation, Judicial decisions, Legal aspects.

Plaintiff brought action against defendant village to recover for damages which occurred when a brook, which ran through the village and adjacent to plaintiff's property, overflowed. Defendant drained its surface waters through sewers into the brook and had constructed, pursuant to an agreement with plaintiff's grantors, a highway over the part of the brook abutting plaintiff's property. Neither the flow nor the course of the brook was altered by this construction. Defendant later constructed additional drainage sewers, and the state constructed a viaduct. Surface water therefrom was discharged into the brook. During heavy rains, the capacity of the brook was insufficient to accomodate the surface waters drained therein. The court held that the village was under no duty to prevent the overflow of the brook. However, although a riparian landowner has a right to drain surface water into a stream which is the natural outlet for such water, he is liable for damages resulting from his overtaxing of such stream's capacity. The burden was on plaintiff to establish that the flooding was caused by defendant's construction of artificial channels. The evidence did not show the construction of the sewers and highway to be the cause of the overflow. Consequently, judgement for defendant was granted. (Price-Florida)
W70-08502

FLOOD PLAIN INFORMATION, ALLEGHENY RIVER AND OLEAN CREEK, OLEAN, NEW YORK.
Corps of Engineers, Pittsburgh, Pa.

US Army Corps of Engineers Flood Plain Report, August 1969. 56 p, 12 fig, 13 plate, 13 tab.

Descriptors: *Floods, *Flood damage, *New York, Flood plains, Historic flood, Flood forecasting, Regional flood, Design flood.
Identifiers: *Olean Creek, *Allegheny River (Olean, N.Y.).

The flood situation along the Allegheny River and Olean Creek within the city limits of Olean, New York, and small portion of the Allegheny River in the town of Olean, upstream from the city of Olean is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections, and text material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. (Woodard-USGS)
W70-08505

FLOOD PLAIN INFORMATION OF ALKALI CREEK - VOLUME II, BILLINGS METROPOLITAN REGION, MONTANA.
Corps of Engineers, Omaha, Nebr.

US Army Corps of Engineers Flood Plain Report, October 1969. 18 p, 2 plate, 2 tab.

Descriptors: *Floods, *Flood damage, *Montana, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood.
Identifiers: Billings (Mont), Standard project flood, Intermediate regional flood.

Flooding of Alkali Creek, Billings, Montana is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. (Knapp-USGS)
W70-08506

FLOOD PLAIN INFORMATION, MARTINS CREEK, NORTHAMPTON COUNTY, PENNSYLVANIA.
Corps of Engineers, Philadelphis, Pa.

US Army Corps of Engineers Flood Plain Report, March 1970. 43 p, 13 fig, 12 plate, 10 tab.

Descriptors: *Floods, *Flood damage, *Pennsylvania, Flood plains, Historic flood, Flood forecasting, Regional flood, Design flood.
Identifiers: *Martins Creek, *Northampton County (Penn).

Flooding of Martins Creek area from its confluence with Waltz Creek upstream to the southerly edge of Bear Swamp in Northampton County, Pennsylvania is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections, and test material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. (Woodard-USGS)
W70-08511

FLOOD PLAIN INFORMATION, MANITOWOC COUNTY, WISCONSIN.
Corps of Engineers, Chicago, Ill.

US Army Corps of Engineers Flood Plain Report, May 1970. 67 p, 19 fig, 19 plate, 18 tab.

Descriptors: *Floods, *Flood damage, *Wisconsin, Flood plains, Historic flood, Flood forecasting, Regional flood, Design flood.
Identifiers: *Manitowoc County (Wis).

The flood situation along the five streams in Manitowoc County, Wisconsin - East Twin River, West Twin River, Manitowoc River, Little Manitowoc River, and Silver Creek - is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections, and test material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. (Woodard-USGS)
W70-08512

A TEST OF FLUSHING PROCEDURES TO CONTROL SALT-WATER INTRUSION AT THE W. P. FRANKLIN DAM NEAR FT. MYERS, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 05G.
W70-08516

THE MAGNITUDE AND EXTENT OF SALT-WATER CONTAMINATION IN THE CALOOSAHATCHEE RIVER BETWEEN LA BELLE AND OLGA, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 05B.
W70-08517

SCHEME FOR THE QATTARA DEPRESSION,
Technische Hochschule, Darmstadt (West Germany).
For primary bibliographic entry see Field 08A.
W70-08523

HYDRO POTENTIAL OF THE TEXAS WATER PLAN,
Texas Tech. Univ., Lubbock.
For primary bibliographic entry see Field 08A.
W70-08524

QUANTITATIVE MORPHOLOGY OF THE DRAINAGE BASIN IN SEMI-ARID ENVIRONMENT,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 02E.
W70-08526

ROUTING MODIFICATIONS TO SUBURBAN DESIGN HYDROGRAPHS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
Brian M. Reich.
Preprint 1141, Proceedings, American Society Chemical Engineers Natural Water Resources Engineering Meeting, Memphis, Tenn, Jan 26-30, 1970. 26 p, 12 fig, 1 tab, 22 ref. OWRR Project No B-010-PA.

Descriptors: *Flood forecasting, *Urbanization, *Routing, *Flood control, Open channel flow, Computer programs, Flood routing, Hydrographs, Hydrograph analysis, Planning, Mathematical models, Storm runoff.
Identifiers: Storm runoff planning.

Stormwater disposal in heterogeneous watersheds that typify modern suburban developments involves the routing of flood flows which arise on first- and second-order tributaries. Streamflow measurements are absent so that the input to the routing must be synthetic hydrographs. Urban and rural hydrographs generated from drainage basin features and a hypothetical rain are combined and routed through streams and proposed reservoirs so that effective use may be planned for the valley bottoms downstream. The influence of deep, narrow flood channels as opposed to broad park-like swales must be studied through the application of routing calculations based upon hydraulic properties. Four watersheds in the fringe suburbs of Philadelphia, Penn., were studied as examples of the suburban setting common to the Northeast. Neither channel routing nor reservoir routing obliterate hydrograph differences. The very small improvement in flood control achieved by combining flat parabolic swales rather than deep rectangular channels with reservoirs may be omitted from considerations on using riparian land for business enterprises. (See also W70-07981) (Knapp-USGS)
W70-08540

WARGO V CONNECTICUT LIGHT AND POWER CO (RELEASE OF IMPOUNDED WATERS AS A RESULT OF NEGLIGENTLY CONSTRUCTED FLASHBOARDS).

127 Conn 629, 18 A2d 924-927 (1941).

Descriptors: *Connecticut, *Hydroelectric plants, *Impounded waters, *Dam failure, Floodgates, Impoundments, Dams, Diversion, Alteration of flow, Obstruction to flow, Riparian rights, Relative rights, Legal aspects, Judicial decisions, Natural flow doctrine, Spillways, Snowmelt, Floods, Floodwater, Damages, Excessive precipitation, Legislation, Rivers, Reasonable use.
Identifiers: *Causation (Legal), *Freshets.

Due to heavy rains and melting snow, there was a freshet in the Housatonic River. Plaintiffs, who were situated a mile below the dam of defendant hydroelectric developer, had their lands damaged and their cottages swept away when flashboards on the dam gave way, thereby releasing the impounded waters. Plaintiffs brought action alleging negligence in the construction and operation of the dam. They contended that defendant was negligent in constructing the flashboards without the permission required by statute, and that such negligence was the proximate cause of their injury. Defendant argued that plaintiff had not proved by the evidence that the damage was not an act of God due to the freshet. The appellate court, in holding for plaintiffs, found the evidence sufficient to support the finding of negligence on the part of the defendant. An upper proprietor upon a stream has no right to gather and impound waters and then sud-

denly release them onto the land of lower proprietors. Each riparian owner is limited to reasonable use of water with due regard to rights of other such owners. It is the common right to have the stream preserved in its natural size, flow and purity without material diversion. (Marsee-Florida)
W70-08550

YATES V METROPOLITAN GOV'T OF NASHVILLE AND DAVIDSON COUNTY (WATER DAMAGE FROM IMPROPER CONSTRUCTION OF FACILITIES).

451 SW2d 437-444 (Tenn Ct App 1969).

Descriptors: *Tennessee, *Easements, *Cities, *Drainage, Diversion, Surface waters, Water works, Pumping, Damages, Ditches, Roads, Paving, Structures, Alteration of flow, Public benefits, Repairing, Engineering structures, Discharge (Water), Public rights, Utilities, Graded, Local governments, Judicial decisions, Legal aspects.

Plaintiff brought action against defendant city for water damage to his property allegedly resulting from the improper construction or maintenance of facilities on an easement adjoining plaintiff's land. Drainage ditches associated with defendant's easement intercepted the natural drainage flow of surface water and diverted it in an unnatural flow upon plaintiff's property. The issues on appeal from a decision for defendant were: (1) was the city liable for damages where it was operating a water system in an easement dedicated to the public, where the surface of the easement constituted a nuisance and damaged a neighboring property owner; and (2) was defendant obligated to remove the diversionary ditch located on the easement. The court held that the city was not liable and that the use of an easement does not entail general maintenance of the land over which it passes unless the holder has made such maintenance necessary by the manner of the use of his easement. The defendant could not be liable where there was no showing that he actually created the nuisance as an incident to the use of his easement. (Barnett-Florida)
W70-08555

S L GARLAND CO V EVERLASTING MEMORIAL WORKS, INC (INJUNCTION AGAINST INTERFERENCE WITH DRAINAGE DITCH).
264 A2d 776-778 (Vt 1970).

Descriptors: *Vermont, *Drainage, *Damages, *Boundary disputes, Boundaries (Property), Legal aspects, Water law, Ditches, Drainage systems, Surface waters, Obstruction to flow, Barriers, Land use, Judicial decisions, Conveyance structures, Flood damage, Remedies, Relative rights.
Identifiers: Injunction (Prohibitory).

Following a lengthy dispute over a common boundary, plaintiff brought action for trespass, alleging that defendant corporation had encroached upon its land by construction of a building and installation of underground tanks. Defendant counterclaimed alleging that plaintiff wrongfully obstructed and destroyed a drainage ditch designed to carry off water from the properties of both parties. Defendant claimed that as a result, great quantities of water were diverted onto defendant's land causing damage to its plant, facilities, and products and impeding access to the plant. The Supreme Court of Vermont ruled that dismissal of plaintiff's suit was proper since the resolution of the boundary dispute was in favor of defendant. In addition, the court held that the equitable relief of injunction against plaintiff's interference with the drainage was appropriate and within the juridiction of the trial court. (Barker-Florida)
W70-08557

FOREST CITY COTTON CO V MILLS (ACCUMULATION OF SEDIMENT IN TRIBUTARY OF DAMMED RIVER AS CREATING DRAINAGE OBSTRUCTION).

219 N C 279, 13 SE2d 557-561 (1941).

Descriptors: *North Carolina, *Mill dams, *Deposition (Sediments), *Reasonable use, Bed load, Bottom sediments, Damages, Legal aspects, Judicial decisions, Natural flow doctrine, Riparian land, Riparian rights, Riparian waters, Natural streams, Impounded waters, Impoundments, Tributaries, Sedimentation, Sediment transport, Sedimentation rates, Remedies, Adjudication procedure, Sands, Ponding.

Plaintiff owned land on a tributary of the river on which defendant operated a mill dam. Plaintiff's land was eight miles above the dam. Plaintiff contended the dam had impeded the flow of the river, which had in turn impeded the flow of the tributary, and that sand and debris were thereby caused to accumulate in the tributary. This made it impossible to drain plaintiff's land. The case was tried in the lower court on the theory of permanent damages, allegations of negligence being eliminated. The appellate court affirmed, finding the evidence sufficient to support the verdict for the defendant. The dissenting opinion urged that the lower court had committed reversable error by instructing the jury concerning the reasonable use doctrine. That doctrine properly applies to lower riparian owners, and here plaintiff was an upper riparian owner. The dissent felt that when a lower owner constructs a dam which causes injury to an upper proprietor, the lower owner becomes liable for injury whether he operates his dam reasonably or unreasonably. (Price-Florida)
W70-08559

NATCHER V CITY OF BOWLING GREEN (COMPENSATION FOR INTERFERENCE BY DAM CONSTRUCTION WITH RIPARIAN RIGHTS).
264 Ky 584, 95 SW2d 255-260 (1936).

Descriptors: *Kentucky, *Riparian rights, *Navigation, *Eminent domain, Dams, Beneficial use, Navigable rivers, Bodies of water, Surface waters, Beds, Ownership of beds, Reservoirs, Riparian waters, Dam construction, Damages, Damsites, Cities, Water resources development, Judicial decisions, Gravels, Beds under water, Municipal water, Compensation, Local governments.

Plaintiff landowner sought removal of a dam which had been constructed by defendant city. Plaintiff owned two gravel bars in a river used by the city as its municipal water supply. When the dam was constructed, the water level of the river was raised and plaintiff could no longer gain access to the bars. Plaintiff argued that defendant had no power to destroy his access to the bars but, if so, then the city was required to compensate him for his loss. Defendant claimed the authority to build the dam through its power to improve navigability of the river and that such action required no compensation of riparian owners. The Court of Appeals of Kentucky, reversing the trial judgment for the city, found that mere expression of increased navigability was insufficient to justify interference with riparian rights where the facts showed no such improvement in navigation. The city could justify the dam construction on the grounds of increasing the municipal water supply and could utilize the eminent domain process to achieve that purpose, but riparian owners had to be compensated for loss of their riparian rights. (Barker-Florida)
W70-08565

COOPER V WILSON (DAMAGES FROM STREAMFLOW DIVERSION).
271 Ky 74, 111 SW 2d 436-437 (1937).

Descriptors: *Kentucky, *Obstruction to flow, *Alteration of flow, *Diversion, Damages, Relative rights, Dams, Natural flow doctrine, Streamflow, Streams, Running waters, Surface waters, Valleys, Barriers, Diversion structures, Judicial decisions, Legal aspects, Brush, Overflow, Flooding.

Plaintiff landowner brought action to recov damages caused his property by defendant's div sion of a stream. The stream ran through the pr perty of bothparties. Plaintiff contended that d fendant had constructed a brush dam which caus the water from the stream to overflow onto plai tiff's land, thus flooding a certain portion there Defendant argued that he was merely seeking avoid damages caused by plaintiff's erection of fence on the stream. The fence accumulated debr carried by the stream, backed up the flow of th stream, and diverted it onto defendant's propert The Court of Appeals of Kentucky, in affirming th trial court's judgment for the defendant, ruled th in an action for damages from diversion of a natur stream, a defendant is relieved of liability whe such diversion is performed only to protect again damages caused by a plaintiff who has also diverte the natural flow of the stream. (Barker-Florida)
W70-08566

EVANS V MASSMAN CONST CO (FLOODIN RESULTING FROM CONSTRUCTION OF DIK UPON NAVIGABLE RIVER).
122 SW2d 924-936 (Mo 1938).

Descriptors: *Missouri, *Dikes, *Floods, *Floo damage, Engineering structures, Structures, Bar riers, Levees, River training, Overflow, Damages Federal government, Project planning, River regu lation, Rivers, Navigable rivers, Engineering Backwater, Judicial decisions, Legal aspects.

Defendant construction company, under a govern ment contract and pursuant to a governmental plan, built a dike to improve the navigation of the Missouri River. In an action to recover damages for flooding, plaintiff contended that defendant had negligently constructed the dike which led to a re tardation of the river's flow which resulted in the river overflowing its banks so as to inundate plain tiff's land. Plaintiff proceeded under two theories. First, plaintiff contended that defendant was negligent in planning and supervising the construction of the dike. Second, plaintiff contended that defendant was negligent in not building the dike according to the government's specifications. The court held that defendant was not liable for negligent planning and supervision since under the contract the government was responsible for planning and supervising. The court held further that plaintiff failed to establish that defendant's negligence, if any, was the proximate cause of the flooding in that it was not shown that the flooding could not have occurred even though the dike had not been built. The jury verdict for plaintiff was reversed. (Snow-Florida)
W70-08570

FISHER V ARKANSAS POWER AND LIGHT CO (NEGLIGENT RELEASE OF IMPOUNDED WATERS BY DAM OWNER).
150 SW2d 959-962 (Ark 1941).

Descriptors: *Arkansas, *Dams, *Discharge (Water), *Impounded waters, Damages, Floods, Surface water, Reservoirs, Reservoir operation, Operations, Water control, Water supply, Impoundments, Gates, Flood damage, Engineering structures, Judicial decisions, Legal aspects, Water storage, Spillway gates, Gate control, Hydroelectric plants, Hydroelectric power, Land tenure.

Plaintiffs, downstream landowners, sought to recover damages to their properties resulting from defendant power company's operation of dams. Plaintiffs contended that the operation of the dams was carried on negligently in that large quantities of water were released through the gates of the dams, thus flooding plaintiffs' properties. Defendant denied negligence in the operation of the dams. The Supreme Court of Arkansas, in affirming the trial court's verdict for defendant, ruled that in the absence of a finding of negligence, a dam owner has the right to release impounded waters at such times and in such quantities as are reasonably necessary for the operation of the dam. Downstream property owners hold their land sub-

ect to these rights of the dam owner. Since no finding of negligence was made at trial, defendant was not liable for the damages to plaintiffs' lands. (Barker-Florida)
W70-08575

GRASSY LAKE AND TYRONZA DRAINAGE DIST NO 9 OF MISSISSIPPI COUNTY V DRAINAGE DIST NO 17 OF MISSISSIPPI COUNTY (JOINT FUNDING FOR LEVEE CONSTRUCTION).
170 SW2d 1007-1012 (Ark 1943).

Descriptors: *Arkansas, *Drainage districts, *Contracts, *Levees, Flood control, Earthworks, Barriers, Flood protection, Surface waters, Regions, Governments, Federal government, United States, Construction, Repayment contracts, Legal aspects, Easements, Judicial decisions, Controlled drainage, Drainage systems, Water policy, Drainage programs, Drainage engineering.

Plaintiff drainage district sought specific performance of a contract executed between it and defendant drainage district. The contract provided that defendant would furnish part of the cost for the construction of a levee to be located wholly within the boundaries of the plaintiff district. However, the levee was designed to protect the land in both districts from the overflow of a river. The federal government was responsible for the construction of the levee, but sharing of the expense by all benefiting parties was comtemplated. Defendant alleged that the entering into the contract to provide money for a levee not situated within its boundaries was an ultra vires act and that the contract should be declared void. Affirming the lower court decision for plaintiff, the Supreme Court of Arkansas ruled that such action taken by a drainage district was within the scope of the legislation creating the district, and the defense of ultra vires was not proper. The decree granting specific performance of the contract was affirmed. (Barker-Florida)
W70-08577

NARAMORE V STATE (DAM FAILURE CAUSED BY UPSTREAM RELEASE OF EXCESSIVELY LARGE QUANTITIES OF WATER AND RESULTING THERMAL EXPANSION OF ICE).
258 App Div 930, 16 NYS2d 551-552 (1939).

Descriptors: *New York, *Dam failure, *Thermal expansion, *Ice loads, Ice, Dams, Blowouts, Cracking, Rupturing, Discharge (Water), New York State Barge Canal, Streams, Damages, Judicial decisions, Legal aspects, State governments, Remedies, Adjudication procedure, Expansion, Channels, Impoundments, Impounded waters, Canals, Relative rights.
Identifiers: *Negligence.

Defendant state of New York, without taking into consideration the fact that the Irondequoit Creek above claimant's dam was frozen to a depth of about two feet, released into the Creek from the New York State Barge Canal large and unusual quantities of water. The large quantities of water and thermal expansion of ice against the dam caused the dam to fail, and claimant brought action to recover damages. In reversing the lower court decision for claimant, the appellate court held per curiam that evidence supported a finding of negligence on defendant's part. However, claimant's recovery was precluded by his contributory negligence. Claimant had failed to maintain, as he had done in previous years, a channel in the ice in front of his dam. Such channel was necessary to permit excessive quantities of water to flow over the dam and to prevent thermal expansion of ice. (Marsee-Florida)
W70-08582

NIGHTENGALE V STATE (NEGLIGENT INCREASE IN FLOWAGE BY STATE).

41 NYS2d 147-148 (App Div 1943).

Descriptors: *New York, *Adjudication procedure, *Alteration of flow, *Flooding, New York State Barge Canal, Remedies, Damages, Livestock, Real property, Legal aspects, Judicial decisions, Canals, Streams, Overflow, Diversion, Land tenure, Flow augmentation, Reservoirs, Streamflow, Water levels, Water level fluctuations, State governments.
Identifiers: *Negligence.

Claimants brought action against defendant state to recover for damages to their real property and livestock caused by overflow and flooding from a creek. Defendant had diverted water from a feeder canal through the creek and into a reservoir for the New York State Barge Canal. The increased flow through the creek resulted in claimants' damages. The lower court dismissed claimants' action on the ground that claimants had not proved any negligence on the part of defendant. The appellate court reversed, holding that the evidence was sufficient, if uncontradicted or unexplained, to warrant a finding that defendant was liable. Findings to the contrary made by the lower court were against the weight of the evidence. (Marsee-Florida)
W70-08583

4B. Groundwater Management

GRAVITY INVESTIGATION OF THE WATER-BEARING STRATA IN SWAN VALLEY, MONTANA,
Montana Univ., Missoula; and Montana Water Resources Research Center, Bozeman.
For primary bibliographic entry see Field 02F.
W70-08149

THE USE OF GRAVITY SHAFTS FOR GROUNDWATER RECHARGE - PHASE I,
North Dakota Water Resources Research Inst., Fargo.
T. R. d'Errico, and M. T. Skodje.
Available from the Clearinghouse as PB-192 762, $3.00 in paper copy, $0.65 in microfiche. Research Project Technical Completion Report, Water Resources Research Institute WI-222-003-70, January, 1970. 22 p, 2 tab, 8 fig. OWRR Project B-008-NDAK (1).

Descriptors: Laboratory tests, Permeability, Turbidity, *Sedimentation, *Shafts (Excavations), Groundwater recharge, North Dakota.
Identifiers: Sheyenne River (North Dakota), *Gravity recharge, Sand-filled shafts, Clogging patterns, Air-binding.

The hydraulic characteristics of shafts consisting of uniformly graded sand were studied in the laboratory to predict their applicability for the recharge of glacially deposited aquifers overlain with impervious soils. Water containing various levels of turbidity was applied to shafts consisting of three different sizes of sand. Piezometers were used to measure the head-loss gradients. At the completion of each test, the amount of sediment trapped in the different levels of the shaft was determined. Permeabilities of the three sand sizes using clear tap water were observed to be 14,400, 4,500, and 3,400 GPD per square foot. No 'airbinding' of the shafts was noted, and the clogging of the shafts was limited to the upper three inches of the shaft. Below this layer the permeability remained constant. Field tests should be conducted to determine whether periodic restoration of the upper level of the shaft is more economical and practical than shaft abandonment and replacement. Two different shaft designs are proposed for use with these two methods of operation. The permeability of the shaft is decreased more rapidly when higher turbidities are applied. Sedimentation of the Sheyenne River water as a method for reducing the sediment loading does not appear practical except during high river stages when turbidities exceed 100 mg per liter.
W70-08152

DEVELOPMENT AND EVALUATION OF WATER HARVESTING SYSTEMS,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 03B.
W70-08153

EVALUATION OF THE SOCIAL IMPACT OF RESERVOIR CONSTRUCTION ON THE RESIDENTIAL PLANS OF DISPLACED PERSONS IN KENTUCKY AND OHIO,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 06B.
W70-08155

USE OF GROUNDWATER FOR IRRIGATION, SEWARD COUNTY, NEBRASKA,
Nebraska Univ., Lincoln. Conservation and Survey Div.
J. M. Jess.
Nebraska Water Survey Paper 25, University of Nebraska, March 1970. 24 p, 4 fig, 5 tab, 7 ref, append.

Descriptors: *Groundwater, *Water utilization, *Withdrawal, *Nebraska, *Irrigation water, Water resources, Water wells, Water yield, Aquifers, Water costs, Economics.
Identifiers: Seward County (Neb).

Irrigation is the principal use of groundwater in Seward County. Domestic, stock, and public supply requirements additionallly contribute to the total demand for groundwater. Increased groundwater use has resulted in a general decline of groundwater levels (3 to 10 feet), mostly in upland areas. Irrigation with groundwater has developed rapidly in Seward County. Pump irrigation has made possible a vigorous, expanding economy. In 1968, 550 wells supplied water to irrigate about 56,000 acres. Average amount of water pumped per well was 76.8 acre-feet. Average pumping cost per acre-foot was $19.60. Corn is planted to 59 percent of the irrigated acreage. Average corn yield was 115 bushels per acre compared to 60 bushels on dry land. Net returns, in dollars, of irrigated and nonirrigated crops are compared. (Knapp-USGS)
W70-08179

WATER RELATIONS OF A PROFILE-MODIFIED SLOWLY PERMEABLE SOIL,
Agricultural Research Service, Bushland, Tex. Southwestern Great Plains Research Center.
Paul W. Unger.
Soil Science Society of America Proceedings, Vol 34, No 3, p 492-495, May-June 1970. 4 p, 6 tab, 11 ref.

Descriptors: *Infiltration, *Aeration, *Soil water movement, *Deep tillage, *Soil management, Soil texture, Land management, Retention, Storage capacity, Soil strength, Porosity.
Identifiers: Southern High Plains (Tex).

A study was conducted with samples obtained from Pullman silty clay loam modified to 90 and 150 cm with a large ditching machine to determine the potential for increasing water intake, retention, and storage by profile modification, and to characterize the modified soil. Profile modification to 90 and 150 cm effectively disrupted the slowly permeable horizon of Pullman soil. Soil bulk density and strength were significantly decreased, and soil porosity was significantly increased. Unmodified soil retained more water on a volumetric basis than modified soil at 1/3- and 15-bars tension, but plant-available water as estimated from the 1/3- and 15-bar values was not altered by modification. The lower water contents of the modified soil at low tensions provided for potentially greater aeration. Water entered modified soil more rapidly than unmodified soil under field conditions. (Knapp-USGS)
W70-08224

A MARYLAND COASTAL AQUIFER,
Maryland State Geological Survey, Baltimore.
For primary bibliographic entry see Field 02L.
W70-08227

STATISTICAL ANALYSIS OF GROUNDWATER USE AND REPLENISHMENT,
Missouri Univ., Rolla. Dept. of Geological Engineering; and Colorado State Univ., Ft. Collins. Dept. of Geology.
John D. Rockaway, Jr., and Robert B. Johnson.
Water Resources Bulletin, Vol 6, No 3, p 408-423, May-June 1970. 16 p, 8 fig, 8 ref.

Descriptors: *Water resources development, *Groundwater, *Water table, *Hydrogeology, *Statistical methods, Water levels, Potentiometric level, Indiana.
Identifiers: *Trend surface analysis.

A statistical technique which offers considerable promise in groundwater studies is the fitting of polynomial trend-surfaces to groundwater data and studying the variations in the surfaces and the residuals from these surfaces over a period of time. The application of trend-surface analysis to groundwater study is based on the premise that the piezometric surface or water table can be approximated by a mathematically computed polynomial surface of the water levels of the wells in the aquifer. The evaluation of trend surface analysis application in groundwater investigations involves a study of the relationship existing between the trend surfaces and the actual groundwater surface and a study of the potential use of the residuals from the trend-surfaces to assist in the location of favorable sites for future development of groundwater resources. The conclusions from the trend surface analysis were compared with conclusions from an independent survey of groundwater conditions. (Knapp-USGS)
W70-08231

BROCK V PORTER (RIGHTS TO WELL WATER PURSUANT TO WRITTEN CONTRACT).

220 N C 28, 16 SE2d 410-411 (1941).

Descriptors: *North Carolina, *Water contracts, *Wells, *Domestic water, Water utilization, Assessments, Claims (Contracts), Contracts, Compensation, Fixed costs, Supply contracts, Legal aspects, Judicial decision, Grants, Relative rights, Adjudication procedure, Water rights, Land tenure, Real property.

The plaintiff and the defendant were adjacent landowners. Pursuant to a written contract between the plaintiff and the defendant's successors in title, the plaintiff granted well water rights for household purposes to the then owners of the land and to subsequent parties occupying the land. Payment for the water rights was to be one dollar per month. There was one dwelling house on the premises when the defendant bought the property. The defendant subsequently constructed a second dwelling house thereon and sought to use the well water for this house also. Plaintiff brought action to determine the rights under the contract. The lower court held that the plaintiff was required to furnish water for one dwelling only. The appellate court reversed, holding that the contract was clear on its face. The plaintiff was to furnish water for household use to the occupiers of this land without limit as to the number of dwellings to be served. (Price-Florida)
W70-08263

LEE V MUT BENEFIT LIFE INS CO (PRESCRIPTIVE RIGHT TO USE OF WELL).
183 SE 66 (Ga 1936).

Descriptors: *Georgia, *Prescriptive rights, *Easements, *Water wells, Land tenure, Real property, Water supply, Competing uses, Relative rights, Water demand, Water utilization, Wells, Subsurface waters, Percolating water, Adjudication procedure.

Plaintiff sought to establish a right to use water from a well owned by defendants. The court held that the allegation that defendants knew that plaintiffs were using water from the well was not sufficient to show an easement by prescription in the well. The allegation was insufficient and immaterial without further evidence tending to show that plaintiff had an easement. The court dismissed the petition on a general demurrer. (Hubener-Florida)
W70-08327

WATER RESOURCES OF THE ARID LANDS,
Aberdeen Univ. (Scotland).
Kenneth Walton.
In: The Arid Zones, Chapter 5, p 101-115. Chicago, Aldine Publishing Company, 1969. 175 p, 11 fig, 185 ref.

Descriptors: *Arid lands, *Water resources, *Surface waters, *Subsurface waters, *Aquifers, Groundwater, Perennial streams, Water resources development, Hydrogeology, Water sources, Groundwater basins, Groundwater recharge, Groundwater reservoirs, Deserts, Water yield, Saline water, Salinity, Limiting factors.

This chapter deals with groundwater and perennial rivers, the two major sources of moisture for arid lands. The author discusses the origin, structure, and location of the various aquifers of the arid zones. He considers sustained yield and saline water the most important problems to be confronted when developing desert aquifers. Arid lands which are watered by perennial streams are touched on briefly. These areas, such as the lands along the Tigris-Euphrates, Nile, Indus, and Colorado-Gila, use dams and other devices to even out the moisture regimes of rivers and thereby regulate the availability of water. There is no doubt that water and its availability will continue to be the determining factor in the development of deserts. (Carr - Arizona)
W70-08351

THE RAFT RIVER BASIN, IDAHO-UTAH, AS OF 1966: A REAPPRAISAL OF THE WATER RESOURCES AND EFFECTS OF GROUNDWATER DEVELOPMENT,
Geological Survey, Boise, Idaho.
E. H. Walker, L. C. Dutcher, S. O. Decker, and K. L. Dyer.
US Geological Survey Open-file report, April 1970. 116 p, 23 fig, 11 tab, 27 ref.

Descriptors: *Hydrogeology, *Groundwater basins, *Idaho, Aquifers, Irrigation water, Water resources development, Water levels, Water yield, Water level fluctuations, Irrigation, Water balance, Surface-groundwater relationships.
Identifiers: Raft River Basin (Idaho).

Much arable land in the Raft River Basin, Idaho lacks water for irrigation, and the potentially irrigable acreage far exceeds the amount that could be irrigated with the basin's 140,000 acre-feet estimated annual water yield. Pumping more groundwater is possible only if large additional groundwater storage depletion can be tolerated. Precipitation ranges from less than 10 inches on the valley floor to more than 30 inches at some places in the mountains. Irrigation with groundwater is widely practiced and about 69,000 acres were irrigated partly or wholly with groundwater in 1966. Basalt lavas of the Snake River Group yield water where they occur below the water table. A few wells that penetrate limestone obtain substantial supplies from crevices. Transmissivity of the composite aquifer is estimated to vary from about 10,000 gpd/ft to more than 45,000 gpd/ft. Surface outflow of the Raft River to the Snake River now amounts to only about 1,900 acre-feet per year, a decline of about 15,000 acre-feet a year from the estimated original average outflow prior to irrigation. Consumption of groundwater for irrigation averag about 1.6 feet per acre annually. The depletion groundwater storage during the years 1952 to 196 was approximately 410,000 acre-feet. By the end 1966 it was nearly 515,000 acre-feet. (Knapp USGS)
W70-08466

RECORDS OF WATER LEVELS AND CHEMI CAL ANALYSES FROM SELECTED WELLS I PARTS OF THE TRANS-PECOS REGION, TEX AS, 1965-68,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02F.
W70-08480

TRANSMISSIVITY AND STORAGE COEFFI CIENT OF AQUIFERS IN THE FOX HILL SANDSTONE AND THE HELL CREEK FORMA TION, MERCER AND OLIVER COUNTIES NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 02F.
W70-08485

PRELIMINARY ANALYSIS OF RATE OD MOVEMENT OF STORM RUNOFF THROUGH THE ZONE OF AERATION BENEATH A RECHARGE BASIN ON LONG ISLAND, NEW YORK,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 02F.
W70-08486

SLOSS-SHEFFIELD STEEL AND IRON CO V WILKES (DAMAGES FROM DRAINAGE OF SURFACE AND PERCOLATING WATERS).

165 So 764-772 (Ala 1936).

Descriptors: *Alabama, *Reasonable use, *Relative rights, *Mining, Excavation, Mining engineering, Underground, Underground structures, Safety, Damages, Cracks, Surface waters, Industries, Percolating water, Subsurface waters, Springs, Spring waters, Wells, Judicial decisions, Legal aspects, Water sources, Land use.

Plaintiff land owner sought to recover damages which resulted from defendant corporation's drainage of surface water from springs and wells located on plaintiff's land. Plaintiff alledged that the drainage occurred when the roofs of two mines operated by defendant collapsed, thus destroying the percolating water which served as the supply for plaintiff's springs and wells. It was alleged that such collapse was the result of negligence by defendant. Defendant contended that there was no violation of due care and that the mining operations did not constitute an unreasonable interference with the use of the water by both parties. In reversing the trial court's judgment for the plaintiff, the Supreme Court of Alabama adopted the reasonable use doctrine whereby a land owner has the right to reasonable use of the water on his land even though the underground waters of neighboring property may be interfered with or diverted. The mining operations were held to be a reasonable use of defendant's property. (Barker-Florida)
W70-08552

4C. Effects on Water of Man's Non-Water Activities

HYDROLOGIC AND BIOTIC EFFECTS OF GRAZING VERSUS NONGRAZING NEAR GRAND JUNCTION, COLORADO,
Geological Survey, Denver, Colo.
Gregg C. Lusby.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC,

20402 - Price $3.25. In: Geological Survey Research 1970, Chapter B, US Geological Survey Professional Paper 700-B, p B232-B236, 1970. 5 p, 5 fig, 4 ref.

Descriptors: *Rainfall-runoff relationships, *Runoff, *Sediment yield, *Grazing, *Land management, Grasslands, Hydrogeology, Water conservation, Water quality, Water yield, Infiltration, Recharge, Soil conservation.
Identifiers: Grant Junction (Colo), Land conservation.

The effect of grazing on the hydrology of salt-desert type rangeland has been studied near Grand Junction, Colo, for the past 14 years. Measurements of precipitation, runoff, erosion, and vegetation have been made in four pairs of watersheds. One of each pair has been grazed by cattle and sheep as is normal in the region, and the other has not been used since the beginning of the study. Measurements made 10 years apart show that all four grazed watersheds have had a slight increase in the amount of bare soil and rock and a decrease in ground cover; cover on ungrazed watersheds has remained virtually unchanged. Runoff in the ungrazed watersheds has been about 30 percent less than in the grazed watersheds, and sediment yield has been about 45 percent less. The greatest change in each of the relationships occurred about 3 years after livestock was excluded from one watershed of each of the pairs. Preliminary studies indicate that within areas of similar physiography, runoff is directly related to the percentage of bare soil present on a watershed. (Knapp-USGS)
W70-08494

ROUTING MODIFICATIONS TO SUBURBAN DESIGN HYDROGRAPHS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W70-08540

MISSOURI PAC RR V BARRON (LIABILITY FOR FLOODING RESULTING FROM OBSTRUCTION OF STREAM BY RAILROAD BRIDGE).

117 SW2d 15-18 (Ark 1938).

Descriptors: *Arkansas, *Flooding, *Bridges, *Obstruction to flow, Flood damage, Damages, Overflow, Floods, Streams, Judicial decisions, Railroads, Stream flow, Flow, Running waters, Drainage, Alteration of flow, Legal aspects, Judicial decisions.

In an action for damages to realty, plaintiff contended that defendant railroad company maintained a railroad bridge which impeded the natural flow of a stream, which passed through plaintiff's land, and thereby flooded such land. Defendant contended on appeal that the jury verdict for plaintiff was not based on substantial evidence. The court reviewed the record and found testimony to the effect that the trestle of the bridge was so constructed down into the bank of the stream so as to reduce the size of the channel through which the water flowed, resulting in an obstruction to the free flow of the stream. Such evidence was held to be substantial enough to support the jury's verdict. (Snow-Florida)
W70-08567

4D. Watershed Protection

STUDY OF WATERSHED HYDROLOGY BY THE WATERSHED EXPERIMENTATION SYSTEM,
Illinois Univ., Urbana. Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 02A.
W70-08182

FOREST HYDROLOGY RESEARCH IN WATERSHED MANAGEMENT,
Oregon State Univ., Corvallis. Dept. of Forest Hydrology and Watershed Management.
James T. Krygier.
In: Water Studies in Oregon, Oregon State University Water Resources Research Institute Fall Quarter 1969 Seminar WR 012.69, Corvallis, p 55-68, January 1970. 14 p, 4 fig, 16 ref.

Descriptors: *Watershed management, *Lumbering, *Water yield improvement, *Water pollution control, Hydrographs, Rainfall-runoff relationships, Soil-water-plant relationships.
Identifiers: *Forest hydrology.

Oregon State University School of Forestry forest watershed management projects reviewed include: (1) comparative water use of different forest stands; (2) the relationship between forest cutting and peak stream-discharges; (3) logging and effects on sediment production; and (4) the relationship between vegetative removal and the water temperature regimes of small streams. Seasonal differences were found in the amount of water transpired and evaporated by stands of Douglas-fir and Oregon white oak. Logging road building could not be detected in the hydrograph when roads constituted less than about 3.5% of a drainage. Peaks were increased significantly at 7.0% of a drainage area and when clearcutting was a large fraction of a drainage basin. Annual sediment loads varied not only because of changing erosion but also the alterations in streamflow regime. Sediment yields were increased significantly for the first two years after logging. After logging there was no apparent change in temperature characteristics of the patch-cut watershed with streamside strips, whereas the temperature of almost fully exposed streams in completely clearcut areas reached a maximum of 85 deg F, an increase of 28 deg F over the pre-logging maximum. (Knapp-USGS)
W70-08474

HYDROLOGIC AND BIOTIC EFFECTS OF GRAZING VERSUS NONGRAZING NEAR GRAND JUNCTION, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 04C.
W70-08494

SEIDEN V PASSAIC VALLEY WATER COMM'N (LIABILITY FOR SEDIMENT IN WATER SUPPLY).
For primary bibliographic entry see Field 05G.
W70-08519

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

AUTOMATED POTENTIOMETRIC TECHNIQUES FOR THE ON-SITE MONITORING OF ANION CONCENTRATIONS IN WATER,
Missouri Water Resources Research Center, Columbia.
Stanley E. Manahan.
Available from the Clearinghouse as PB-192 809, $3.00 in paper copy, $0.65 in microfiche. Completion Report, 1970. 17p, 2 tab, 6 ref. OWRR Project B-023-MO (4).

Descriptors: *Water analysis, *Analytical techniques, *Nitrates, *Electrodes, Ions, Fluorides, Microbiology, Bacteria, Volumetric analysis, Water chemistry, Pollutant identification, *Monitoring.
Identifiers: Ion-selective electrodes, Standard addition, *Potentiometry.

Characteristics of several of the new non-glass ion-selective electrodes and of several reference electrodes were studied in detail with particular emphasis upon the nitrate ion-selective electrode. A new high accuracy standard addition technique for the potentiometric determination of nitrate ion in a cell without liquid junction using the fluoride electrode as a reference was developed. This method eliminates the liquid junction and dilution and activity coefficient changes cancel. The method is applicable to all monovalent anions for which an electrode is available and enables the determination of anion concentrations to within 1% relative accuracy. Low temperature potentiometric titrations of perchlorate and tetrafluoroborate ions with tetraphenylarsonium chloride and ion-selective electrodes were investigated and found to give high accuracy and reasonably good sensitivity for these ions. The nitrate electrode was used to follow nitrate ion concentration in microbial cultures. It was found to be useful for following nitrate ion reduction in situ. (See also W70-08157 thru W70-08160) (Manahan-University of Missouri)
W70-08156

NITRATE ION-SELECTIVE ELECTRODE IN MICROBIAL MEDIA,
Missouri Water Resources Research Center, Columbia.
Stanley E. Manahan.
Applied Microbiology, Vol. 18, p 479-481, Sept., 1969. OWRR Project B-023-MO.

Descriptors: Bacteria, *Nitrates, *Electrodes, *Microbiology, Ions, Nitrites, Pollutant identification, Analytical techniques, *Chemical analysis.
Identifiers: *Ion-selective electrodes.

A nitrate ion-selective electrode has been used to follow the kinetics of the reduction of nitrate to nitrite by a bacillus isolated from the rumen of a sheep. The electrode system and the microbial culture were found to be quite compatible, although the formation of nitrite limits the utility and precision of the measurement. The formation of nitrite was followed simultaneously by a colorimetric method. Nitrate was converted quantitatively to nitrite. The rate of the reaction was found to increase to a plateau value, then drop abruptly when the nitrate was exhausted. (See also W70-08158) (Manahan-University of Missouri)
W70-08157

FLUORIDE ELECTRODE AS A REFERENCE IN THE DETERMINATION OF NITRATE ION,
Missouri Water Resources Research Center, Columbia.
Stanley E. Manahan.
Analytical Chemistry, Vol. 42, p 128-129, January, 1970. OWRR Project B-023-MO.

Descriptors: *Nitrates, *Fluorides, *Analytical techniques, *Water analysis, *Electrodes, Ions, Volumetric analysis, Water chemistry, Pollutant identification.
Identifiers: Potentiometry, Ion-selective electrodes, Standard addition.

The fluoride ion-selective electrode was used as a reference electrode for the standard addition determination of nitrate ion with the nitrate ion-selective electrode. The nitrate electrode was hooked to the measuring side of an expanded-scale pH meter and the fluoride electrode was connected to the reference side. The potential of the fluoride electrode was poised by the addition of a low concentration of fluoride ion to the solution to be measured. At the concentration levels used, the nitrate electrode does not respond to fluoride ion nor does the fluoride electrode respond to nitrate ion. The electrode system is very stable and the liquid junction is eliminated. The concentration of nitrate ion is determined by adding a measured amount of standard nitrate to a known volume of unknown nitrate solution and calculating the original nitrate ion concentration from the shift in potential. Dilution effects and activity coefficient changes cancel. Nitrate ion concentrations in the range 0.00005 to 0.01 M were determined with a relative accuracy

within 1%. The technique is applicable to other monovalent anions for which electrodes are available. (See also W70-08159) (Manahan-University of Missouri)
W70-08158

ION-SELECTIVE ELECTRODES FOR NITRATE ANALYSIS,
Missouri Water Resources Research Center, Columbia.
Stanley E. Manahan.
Proceedings, 3rd Annual Conference 'Trace Substances in Environmental Health-III, University of Missouri, Columbia, p 353-357, June 24, 26, 1969.
OWRR Project B-023-MO.

Descriptors: *Nitrates, *Fluorides, *Analytical techniques, Water analysis, *Electrodes, Ions, Water chemistry, Pollutant identification.
Identifiers: *Ion selective electrodes, Potentiometry, Standard Addition.

A standard addition analysis technique has been developed for nitrate where the fluoride ion-selective electrode is used as a reference electrode in solutions spiked with a low concentration of fluoride ion. The electrode system is more stable than the conventional system. Since a reference with liquid junction is not used, errors arising from liquid junction potential are eliminated. Dilution from the addition of standard affects both electrodes equally. Dilution corrections need not be made and a relatively large volume of standard may be added. Changes in ionic strength resulting from the addition of the standard affect the activity coefficients of both the fluoride and nitrate ions similarly and no errors are produced by the change in activity coefficients. Determinations of nitrate in the concentration range of 0.00005 M to 0.01 M have given reproducable results within plus or minus 1% and relative standard deviations of 0.5%. (See also W70-08160) (Smith-University of Missouri)
W70-08159

LOW TEMPERATURE PRECIPITATION TITRATION OF PERCHLORATE AND TETRAFLUOROBORATE WITH TETRAPHENYLARSONIUM CHLORIDE AND ION-SELECTIVE ELECTRODES,
Missouri Water Resources Research Center, Columbia.
Michael J. Smith, and Stanley E. Manahan.
Analytica Chimica Acta, Vol. 48, p 315-319, 1970.
OWRR Project B-023-MO.

Descriptors: *Volumetric analysis, *Analytical techniques, Electrodes, Ions, *Chemical precipitation, Pollutant identification, Chemical analysis.
Identifiers: *Perchlorate, *Tetrafluoborate, Precipitation titrations.

Perchlorate and tetrafluoroborate have been determined at low concentrations by precipitation titration with tetraphenylarsonium chloride, the appropriate anion-selective electrodes being used to follow the course of the titration potentiometrically. A low temperature, 2 deg, was employed to sharpen the titration curves, thus resulting in greater accuracy and lower limits of analysis. As little as 0.05 mmol of perchlorate and 0.25 mmol of tetrafluoroborate have been determined to within 1% relative accuracy. These limits could easily be extended by a factor of 10 by using a miniaturized titration apparatus. (See also W70-08156) (Manahan-university of Missouri)
W70-08160

SULFIDE TO SULFATE REACTION MECHANISM--A STUDY OF THE SULFIDE TO SULFATE REACTION MECHANISM AS IT RELATES TO THE FORMATION OF ACID MINE WATERS.
Ohio State Univ. Research Foundation, Columbus.
For primary bibliographic entry see Field 05G.
W70-08161

SENSITIVITY OF BENTHIC MICROFLORA TO POLLUTION GRADIENTS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 05C.
W70-08164

THE PRACTICE OF WATER POLLUTION BIOLOGY,
Federal Water Pollution Control Administration, Washington, D.C. Div. of Technical Support.
Kenneth M. Mackenthun.
Report for sale from Superintendent of Documents, US Government Printing Office, Wash, DC, 20402 - Price $1.50. Federal Water Pollution Control Administration Publication, Wash, DC, 1969. 281 p, 85 fig, 15 tab, 392 ref.

Descriptors: *Water pollution, *Investigations, *Water quality, *Water pollution effects, Bioindicators, Water pollution control, Pollutant identification, Surveys, Sampling, Data collections, Environmental effects, Ecology, Biological communities, Microbiology, Eutrophication, Water supply, Sewage treatment.
Identifiers: Water pollution biology.

This book presents some practical water pollution biological field investigative techniques and practices, procedures to solve problems, data analyses, interpretation and display, and the development and writing of the investigative report. It is written principally for the biologist inexperienced in these activities, and for sanitary engineers, chemists, attorneys, water pollution control administrators, and others. Aquatic environments, their biotic constituents, and the effects of various pollutants upon them are considered. Field investigations that include forming the study objectives, planning the field study, station selection, sample collection and examination, data analyses and interpretation, and reporting the results are described. Examples of field studies on specific water pollution problems are given with the collected data presented in many graphic variations. Examples of field investigations, including data collection, analyses, interpretation and display are given for organic wastes, silts, toxic wastes, acid mine drainages, eutrophication, and radioactive wastes. The biology of municipal water supplies and sewage treatment, biological nuisances, and slimes are discussed. (Knapp-USGS)
W70-08197

CLASSIFICATION OF ORGANIC POLLUTION IN SURFACE WATERS,
Research Inst. for Industrial Water Treatment, Prague (Czechoslovakia).
A. Brodsky, J. Prochazka, and H. Vydrova.
Journal of American Water Works Association, Vol 62, No 6, p 386-390, June 1970. 5 p, 12 fig, 13 ref.

Descriptors: *Organic matter, *Humus, *Sulfite liquors, *Analytical techniques, Chromatography, Chemical analysis, Water quality, Water analysis, Water pollution, Pollutant identification.
Identifiers: Oden's classification.

Oden's classification of humic substances in natural waters was compared with the elution patterns of these materials on Sephadex. The elution patterns of humic groups in the sense of Oden's systematics were shown using Sephadex G 75 grade. Basic peat extracts were prepared using different manners of preparation to duration of extraction period, buffer capacity and ion strengths of extraction agents. Isolation procedures, either precipitation or dissolving of precipitate followed by considerable changes in pH value or alcohol extractions influenced the proportions of fractions with smaller size particles. Drying of samples had a still more disturbing effect. It is possible to separate several fractions from humic substances using the G 75 grade without having any substantial portions of substances that were not displaced from the column. Under standardized conditions the elution curves may be used for qualitative--and, to a certain extent quantitative--estimation of individual groups of humic substance participation in the sample. (Knapp-USGS)
W70-08236

PRELIMINARY ANALYSES OF THE WASTE WATER AND ASSIMILATION CAPACITIES OF THE ANACOSTIA TIDAL RIVER SYSTEM,
Federal Water Quality Administration, Annapolis Md. Chesapeake Technical Support Lab.
Norbert A. Jaworski, Leo J. Clark, and Kenneth D. Feigner.
Federal Water Quality Administration, Chesapeake Technical Support Lab Report No 39, April 1970. 57 p, 16 fig, 4 tab, 5 ref, 3 append.

Descriptors: *Estuaries, *Water pollution effects, *District of Columbia, Tidal effects, Nutrients, Eutrophication, Water quality, Water pollution control, Surveys, Investigations, Path of pollutants, Sampling, Water analysis, Algae, Coliforms, Dissolved oxygen.
Identifiers: *Anacostia River.

A preliminary analysis of waste water assimilation and transport capacities was made of the tidal portion of the Anacostia River, Washington, D.C. The mean streamflow in the basin is about 122 cfs and the 7-day low flow with a recurrence interval of once-in-ten-years is 8 cfs. Based on 1969 sampling data, the water quality conditions in the tidal river under summer conditions are typified by: (a) Low dissolved oxygen concentrations often falling below 2.0 mg/l, (b) high fecal coliform densities often above 10,000 MPN/100 ml, (c) high turbidity levels especially during periods of high runoff, and (d) high nutrient concentrations. The most pronounced degradation results from storm sewers and combined sewer overflows and defective sanitary sewer systems. Mathematical model investigations of the Anacostia River indicate that waste water assimilation and transport capabilities for large advective flows are most sensitive to the decay rate of a pollutant and not to the dispersion effect of the tidal system. The sensitivity of the decay rate is a result of the long detention time, while the effect of dispersion is diminished by the pronounced advective movement. The tidal system capability to assimilate oxygen-demanding waste water is currently being exceeded. If waste water were subjected to high carbonaceous and nitrogenous BOD removal and if the effluent is aerated to 6.0 mg/l, the present water quality of the Anacostia River would be enhanced. (Knapp-USGS)
W70-08249

INCREASING THE RELIABILITY OF EXPERIMENTAL RESULTS ARRIVED AT IN STUDIES ESTABLISHING HYGIENIC STANDARDS FOR HARMFUL SUBSTANCES IN BODIES OF WATER,
S. N. Cherkinskiy, and G. N. Krasovskiy.
Available from the Clearinghouse as PB-185 824T, $3.00 in paper copy, $0.65 in microfiche. Translated from Russian. In: USSR Literature on Water Supply and Pollution Control, CFSTI, Vol 10, 1969, p 4-13.

Descriptors: *Water pollution, *Organic compounds, *Analytical techniques, *Pollutants, Methodology, Toxicity, Organic wastes, Organoleptic properties, Water pollution effects.

Common methodological errors in the analysis of harmful substances in water are discussed. The discussion includes: (1) Physical and chemical properties of pollutants; (2) stability of pollutants in water; (3) study of the organoleptic properties of water; (4) effects of pollutants on the overall sanitary regime of natural water bodies; and (5) sanitary toxicological investigations. Evaluation of pollutant data and interpretation of results are briefly mentioned. (Carstea-USGS)
W70-08285

XPERIMENTAL BASIS FOR THE DETER-INATION OF MAXIMUM PERMISSIBLE NILINE CONCENTRATION IN WATER ODIES,
A. I. Cooper, and V. P. Ozerova.
Available from the Clearinghouse as PB-185 824T, $3.00 in paper copy, $0.65 in microfiche. Translated from Russian. In: USSR Literature on Water Supply and Pollution Control, CFSTI, Vol 10, 1969, p 93-101.

Descriptors: *Water pollution, *Pollutants, *Analytical techniques, Methodology, Organoleptic properties, Organic compounds, Toxicity, Odor, Taste, Color, Biochemical oxygen demand.
Identifiers: *Aniline.

A chemically pure sample of aniline was used to determine its maximum permissible concentration and stability in water. Taste, odor and color of polluted water were changed by aniline. The threshold concentration for taste and odor was found to be 50-100 mg/liter, while that for color was 200 mg/liter. Aniline undergoes oxidation by biochemical processes and the biochemical oxygen demand is increased. The critical levels of biochemical oxygen demands can be avoided if the aniline concentration does not exceed 0.5 mg/liter. Based on the toxicological index, the maximum permissible aniline concentration in water was recommended as 0.1 mg/liter. (Carstea-USGS)
W70-08286

EXPERIMENTAL DETERMINATION OF MAXIMUM PERMISSIBLE POTASSIUM AND AMMONIUM THIOCYANATE CONCENTRATIONS IN BODIES OF WATER,
Ya. M. Kostovetskiy, K. F. Meleschenko, Z. I. Zholdskova, R. K. Rozhkovetskaya, and A. I. Lur'ye.
Available from the Clearinghouse as PB-185 824T, $3.00 in paper copy, $0.65 in microfiche. Translated from Russian. In: USSR Literature on Water Supply and Pollution Control, CFSTI, Vol 10, 1969, p 102-109.

Descriptors: *Water pollution, *Pollutants, *Analytical techniques, Methodology, Organoleptic properties, Organic compounds, Toxicity, Odor, Taste, Color, Biochemical oxygen demand.
Identifiers: Potassium thiocyanate, Ammonium thiocyanate, Hydrocarbon metabolism, Maximum permissible concentration.

Thiocyanate compounds have little effect upon water odor, color or transparency. The threshold of taste perception is 100 mg/liter. Biochemical oxygen demand showed an increase with increasing concentration of thiocyanates. Body weight, peroxydase activity of the blood, hydrocarbon metabolism and the morphology of the internal organs are not adversely affected by does of thiocyanates which varied between 0.5 and 0.0005 mg/kg. The maximum permissible concentration of thiocyanates in natural water is recommended at 0.1 mg/liter. (Carstea-USGS)
W70-08287

BASIC EXPERIMENTS FOR THE DETERMINATION OF MAXIMUM PERMISSIBLE NORSULFAZOLE CONCENTRATION IN WATER BODIES,
O. N. Yelizarova, A. I. Kuper, L. V. Zhidkova, A. A. Khutoryanskiy, and K. O. Lastochkina.
Available from the Clearinghouse as PB-185 824T, $3.00 in paper copy, $0.65 in microfiche. Translated from Russian. In: USSR Literature on Water Supply and Pollution Control, CFSTI, Vol. 10, 1969, p 129-136.

Descriptors: *Biochemical oxygen demand, *Dissolved oxygen, *Analytical techniques, Methodology, Pollutants, Organic compounds, Water pollution, Theoretical analysis, Chemical reactions, Chemical degradation.
Identifiers: Nomograms.

Biochemical oxygen demand and dissolved oxygen were used to determine the maximum permissible concentration of 11 organic pollutants in open water bodies. Determination of total biochemical oxygen demand is a complex and time-consuming procedure. Therefore, a first-order monomolecular-reaction equation in which the rate of the process is proportional to the concentration of residual unreacted material is used to determine the total biochemical oxygen demand. Nomograms were devised to compute the rate constant (k) for incubation periods of 2-5 and 3-5 days. (Carstea-USGS)
W70-08290

EXPERIMENTAL DETERMINATION OF THE MAXIMUM PERMISSIBLE CONCENTRATION OF PROPYLBENZENE IN WATER BODIES,
R. D. Smirnova, and I. M. Stepanova.
Available from the Clearinghouse as PB-185 824T, $3.00 in paper copy, $0.65 in microfiche. Translated from Russian. In: USSR Literature on Water Supply and Pollution Control, CFSTI, V. 10, 1969, p 122-128.

Descriptors: *Water pollution, *Pollutants, *Analytical techniques, Methodology, Organoleptic properties, Taste, Odor, Color, Toxicity, Biochemical oxygen demand.
Identifiers: *Propylbenzene.

The threshold concentration of propylbenzene with respect to odor perception is 0.2 mg/l. The self-purification processes of water containing up to 10 mg/l of propylbenzene were not affected. The effect of 0.2 mg/l of propylbenzene upon biochemical oxygen demand was slight. The toxicological threshold concentration of propylbenzene is 0.5 mg/l which is also the maximum permissible concentration. (Carstea-USGS)
W70-08291

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES - CHLORINATED HYDROCARBON PESTICIDES IN CALIFORNIA BAYS AND ESTUARIES,
California State Dept. of Fish and Game, Menlo Park, Calif. Marine Resources Operations.
John C. Modin.
Pesticides Monitoring Journal, Vol. 3, No. 1, June 1969. p 1-7, 1 fig, 6 tab, 7 ref.

Descriptors: *Pesticide residues, *Monitoring, *DDT, *Dieldrin, Endrin, Pesticide drift, Chlorinated hydrocarbon pesticides, *Estuaries, Oysters, Clams, Bottom sediments, Chinook Salmon, Shellfish, Shrimp, Crabs, Gas chromatography, Fish eggs.
Identifiers: DDD, DDE, *Pesticide monitoring, Mussels, Halibut, Flounder, Seasonal variations, *California estuaries, Humboldt Bay, Morro Bay.

As part of a nationwide program to monitor organochlorine pesticide residues in estuaries, the U. S. Bureau of Commercial Fisheries in January 1966 contracted to the California Department of Fish and Game the responsibility to monitor selected estuaries in California for pesticides. Analyses of oysters, mussels, and clams sampled at points of interest within each estuary revealed DDT, DDD, DDE, dieldrin, and endrin in concentrations from 10 to 3,600 ppb. Calculations are based on the laboratory wet weight of homogenized tissue. In studies of offshore exposure, high levels of DDT, DDD, and DDE were found in a king crab (2,739 ppb) and in ova from a king salmon (668 ppb). Pesticides were also measured in the ova of prawn, flounder, halibut, and sole; of these, halibut ova were the most highly contaminated, with DDE, DDD, and DDT measuring 591 ppb. (Sjolseth-Washington)
W70-08363

DISTRIBUTION OF MERCURY IN WATER, BOTTOM MUD AND AQUATIC ORGANISMS OF MINAMATA BAY, THE RIVER AGANO AND OTHER WATER BODIES IN JAPAN,
Freshwater Fisheries Research Lab., Tokyo (Japan).
Yoshihiro Matida, and Hiroshi Kumada.
Bulletin of Freshwater Fisheries Research Laboratory, Contribution no. 253, Vol 19, No. 2, 1969. p. 73-93, 6 tab, 1 fig, 30 refs.

Descriptors: *Heavy metals, *Distribution, *Water analysis, Water chemistry, Water pollution effects, Water pollution sources, *Bottom sediments, *Aquatic animals, On-site investigations, Copper, Plankton, Aluminum, Manganese, Public health, Waste water disposal.
Identifiers: *Mercury, Japan, *Minamata Bay disease, Agano River, Thallium.

The distribution of mercury and other heavy metals in water, bottom mud, and aquatic organisms was determined for Minamata Bay and other water bodies in Japan. Among the heavy metals analyzed (Mercury, Manganese, copper, iron, titanium, thalliam, and aluminum) only mercury was very high in Minamata Bay and the Agano River where minamata disease had occurred. The distribution of mercury in Minamata Bay indicated that the origin of mercury was a plant which produced acetaldehyde from acetylene and water by the catalytic action of mercuric sulfate. The authors feel that since the content of total and organic mercury is high in aquatic organisms in many Japanese waters, that monitoring, background surveys, and studies on the accumulation mechanisms of heavy metals are desirable. (Sjolseth-Washington)
W70-08369

STUDIES ON THE METABOLISM OF PENTACHLOROPHENATE, A HERBICIDE, IN AQUATIC ORGANISMS--I. TURNOVER OF ABSORBED PCP IN TAPES PHILIPPINARIUM. (In Japanese),
Kyushu Univ., Fukuoka (Japan). Faculty of Agriculture; and Tokyo Univ. of Fishery (Japan).
For primary bibliographic entry see Field 05C.
W70-08375

STUDIES ON THE METABOLISM OF PENTACHLOROPHENATE, A HERBICIDE, IN AQUATIC ORGANISMS -III. ISOLATION AND IDENTIFICATION OF A CONJUGATED PCP YIELDED BY A SHELL-FISH, TAPES PHILIPPINARUM (In Japanese),
Kyushu Univ., Fukuoka (Japan). Faculty of Agriculture; and Tokyo Univ. of Fishery (Japan).
Kunio Kobayashi, Akitake Hiroshi, and Tetuo Tomiyama.
Bulletin, Japanese Society of Scientific Fisheries, Vol. 36, No. 1, 1970, p 103-108, 11 refs, 5 figs, 3 tables.

Descriptors: Carbon radiosotopes, *Analytical techniques, Chromotography, Mode of action, *Isolation, Shell-fish.
Identifiers: *Pentachlorophenate, Carbon-14, *Tapes philippinarum, Detoxification, Biochemical change, *Biosynthesis, Identification, *Conjugated pentachlorophenate.

This paper deals with the isolation and identification of a conjugated 14C-labelled PCP-Na which is biosynthesized by the shell-fish. A PCP conjugate was isolated by treating a shell-fish culture medium with activated charcoal, followed by elution with ammonia-acetone, and finally by subjecting the eluate to silica-gel thin layer chromatography. The behaviors of the isolated conjugate in the chromatography and in the extractability with xylene were identical to those of synthesized PCP sulfate. An experimental result that the molar ratio of PCP to SO4 was about unity, evidences that the isolated PCP conjugate is a sulfate ester of PCP. It is to be concluded, therefore, that PCP can be largely detoxicated in the shell-fish by the conjugation with sulfate. (Sjolseth-Washington)
W70-08378

STUDIES ON THE METABOLISM OF PENTACHLOROPHENATE, A HERBICIDE, IN AQUATIC ORGANISMS -II. BIOCHEMICAL CHANGE OF PCP IN SEA WATER BY DETOXICATION, MECHANISM OF TAPES PHILIPPINARUM (In Japanese),
Kyushu Univ., Fukuoka (Japan). Faculty of Agriculture; and Tokyo Univ. of Fishery (Japan).
Kunio Kobayashi, Hiroshi Akitake, and Tetuo Tomiyama.
Bulletin, Japanese Society of Scientific Fisheries, Vol. 36, No. 1, 1970. p 96-102, 10 refs, 3 figs, 4 tab.

Descriptors: Carbon radioisotopes, *Biodegradation, *Analytical techniques, Shellfish, Herbicides, *Tracers, Mode of action, Distribution patterns, Sea water, Chemical properties.
Identifiers: *Pentachlorophenate, Carbon-14, *Tapes philippinarum, *Biochemical change, *Detoxification.

This paper deals with a study, using 14C-labelled PCP, on the biochemical change of PCP in the medium during the culture of Tapes philippinarum. It was elucidated that the decrease of PCP in the medium did not mean its decomposition, but its transformation some bound-form by the detoxication mechanism of the shell-fish. It was also confirmed that the excreta of shell-fish and micro-organisms in the medium played no role in the formation of the bound PCP. Although the bound PCP was not extracted with xylene from the acidified aqueous solution (0.02 N HCl) by the standard method for PCP determination, it was, however, determined as free PCP from the distillate of the steam-distillation of the acidified sample (0.6 N HCl). (Sjolseth-Washington)
W70-08379

LAKE MICHIGAN WATER QUALITY AS RELATED TO CHICAGO'S WATER TREATMENT PLANTS,
Department of Water and Sewers, Chicago, Ill.
James C. Vaughn.
A report presented at the FWPCA Four-State Conference on Pollution of Lake Michigan and Its Tributary Basin, Milwaukee, March 31, 1970. City of Chicago Department of Water and Sewers, March 31, 1970. 40 p, 16 fig, 11 tab.

Descriptors: *Lake Michigan, *Water quality, *Water works, *Water treatment, *Water supply, *Water quality control, *Lake morphology, *Water pollution, *Limnology, Water pollution effects, Pollution abatement, Lake basins, Odor, Chlorides, Sulfates, Phosphorus, Coliforms, Nitrogen, Plankton, Chemical analysis, Sampling, Monitoring.
Identifiers: *Chicago, Southern Lake Michigan, Conference on Pollution of Lake Michigan and Its Tributary Basin.

This report is the third presented at sessions of the Four-State Conference on Pollution of Lake Michigan and Its Tributary Basin. It describes the water quality of Lake Michigan and some of its tributaries, including the Indiana Harbor Ship Canal and the Calumet, Grand Calumet and Little Calumet rivers. The report focuses on the water quality of Lake Michigan in the vicinity of the South Water Filtration Plant, one of Chicago's two filtration plants. On the basis of continuing water sampling and analysis program involving studies of 24 quality parameters, the City reported that the water quality of Lake Michigan at the South Plant showed a marked improvement in 1969, except for Phosphorus, Nitrogen and Threshold Odor values. Bacteriological quality improved and plankton counts were lower; however, concentrations of inorganics increased. Costs of chemical treatments at the South Plant are tabulated. The report also includes comparisons of 1968 and 1969 water quality data for the west shore of Lake Michigan near the northern boundary of the City. A marked decline in quality, as measured by Phosphorus, Nitrogen, and Total Coliform, was evidenced. It is recommended that immediate and drastic action be taken to improve the quality of discharges to Lake Michigan along the North Shore. (Poertner)
W70-08433

SPECTROCHEMICAL DETERMINATION OF MICROGRAM QUANTITIES OF GERMANIUM IN NATURAL WATER CONTAINING HIGH CONCENTRATIONS OF HEAVY METALS,
Geological Survey, Sacramento, Calif.
Alex E. Dong.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402 - Price $3.25. In: Geological Survey Research 1970. Chapter B, US Geological Survey Professional Paper 700-B, p B242-B244, 1970. 3 p, 1 fig, 2 tab, 5 ref.

Descriptors: *Trace elements, *Water chemistry, *Groundwater, *Brines, *Spectroscopy, California, Analytical techniques, Chemical analysis.
Identifiers: Germanium.

A procedure is described for the chemical separation and determination of microgram quantities of germanium in water containing high concentrations of heavy metals. Before being subjected to spectrochemical determination, germanium is selectively isolated from other major and minor elements in the water in order to avoid undesirable dilution effects. The average error for eight determinations is plus or minus 9 percent, and the relative standard deviation is 8.0 percent, a level of precision satisfactory for spectrochemical determination of trace quantities of germanium. (Knapp-USGS)
W70-08496

REPORT ON DIFFERENTIAL THERMAL AND THERMOGRAVIMETRIC ANALYSIS,
Wrightsville Beach Test Facility, N.C.
For primary bibliographic entry see Field 03A.
W70-08507

QUANTITY AND CHEMICAL QUALITY OF LOW FLOW IN CIBOLO CREEK, TEXAS, MARCH 4-8, 1968,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02E.
W70-08509

DETERMINATION OF TOTAL NITROGEN, PHOSPHORUS AND IRON IN FRESH WATER BY PHOTO-OXIDATION WITH ULTRAVIOLET RADIATION,
Norsk Institutt for Vannforskning, Oslo.
A. Henriksen.
Analyst, Vol 95, No 1131, p 601-608, June 1970. 8 p, 2 fig, 5 tab, 14 ref.

Descriptors: *Chemical analysis, *Nitrogen, *Phosphorus, *Iron, *Water analysis, Oxidation, Organic matter, Chemical reactions, Ultraviolet radiation, Light.
Identifiers: Photo-oxidation analysis.

A photo-oxidation method for determining total phosphorus and nitrogen in sea water was adapted for analysis of fresh-water samples and includes the determination of total iron. Samples are subjected to ultraviolet irradiation in a photochemical reactor consisting of a high pressure mercury-arc lamp, a reactor body with twenty-four fused silica sample tubes and a cooling fan. Organically combined phosphorus and iron are converted into orthophosphate and iron (III) ions in the presence of acid and excess of oxygen after an irradiation time of 1 hour. Organonitrogen compounds and ammonia in solutions with pH range 6.5 to 9 are oxidized to nitrate and nitrite after 4 hours' irradiation in the presence of excess of oxygen. (Knapp-USGS)
W70-08513

MERCURY CONTAMINATION IN THE NATURAL ENVIRONMENT,
Bureau of Commercial Fisheries, Ann Arbor, Mich.; and Dept. of Interior, Washington, D.C. Office of Library Services.
Ruth Rehfus, Arthur H. Priddy, and Mildred E. Barnes.
Available from the Clearinghouse for Fed Scientific and Technical Information, as PB-1 910, $3.00 in paper copy, $0.65 in microfiche. partment of Interior Office of Library Serv Cooperative Bibliography, July 1970. 32 p, 209 index.

Descriptors: *Bibliographies, *Water pollut *Pollutants, *Heavy metals, *Poisons, Water po tion sources, Water pollution effects, Chem wastes, Farm wastes, Environmental effects, W dlife, Birds, Analytical techniques, Publicati Diseases, Toxicity, Water quality.
Identifiers: Mercury, Mercury pollution.

A bibliography was made of literature concern mercury pollution. The purpose of this bibli raphy is to provide access to the literature for th beginning to work on the problem. English l guage material relating to fish, wildlife and wa pollution was given full coverage. So much lite ture exists on other phases such as analysis, agric tural uses, industrial health, and clinical medici that it could not all be included. The criteria selection in these areas were close relationship environmental contamination, recommendati of scientists, or the presence of literature reviews substantial bibliographies. (Knapp-USGS)
W70-08541

5B. Sources of Pollution

SPREADING AND MOVEMENT OF O SPILLS,
New York Univ., Bronx. Dept. of Chemical E gineering.
Henry G. Schwartzberg.
Available from the Clearinghouse as PB-192 85 $3.00 in paper copy, $0.65 in microfiche. Wat Pollution Control Research Series, March 197 103 p, 9 tab, 21 fig, 82 ref. FWQA Program 15 80-EPL---4/70, Contract WP 01342-01A.

Descriptors: *Oily water, *Oil-water interface *Drifting (Aquatic), *Waves (Water), *Winds, C wastes, Oil, Water pollution control, Wind velocit Water pollution sources, *Path of pollutants.
Identifiers: *Oil spillage, Oil spill (Spreading rates Oil lenses, Wind drift, Wave drift.

The spreading and movement of oil spills on wate were investigated. Areas for spills which form le ses were measured and correlated. Most crud tested formed thin films, not lenses; but lens form tion could be induced and spreading great reduced by surfactant treatment. Spreading rat for small spills were measured and correlated wit spill volume, oil density and water viscosity. Fie data and energy conservation, however, indicate that these aspects of small spills cannot be scale up to large spill volumes. Wind-water basin tests in dicated that on quiet open water oil should dri windward at 3.66 plus or minus .17% of the win velocity. The percentage drift was not significantl affected by oil or water properties, depth, and win speed, and agrees fairly well with field data. Wave caused significant reductions in wind drift, but i the shallow basin used did not induce significan drift themselves. Since wind causes waves, an deep water waves cause drift, further investigatio of wind and wave drift interaction is recommende Wind drift was found to be confined to a thin su face layer. The use of 1 - 1 1/2 inch deep oil-confi ing drogues markedly reduced wind drift. Investiga tion of the use nets of such drogues and of lens fo mation to reduce oil spread and movement recommended. In all cases combined wind and cu rent drifts were found to be less than the curren drift in the absense of winds.
W70-08163

A METHOD FOR PREDICTING POLLUTAN TRANSPORT IN TIDAL WATERS,
California Univ., Berkeley. Hydraulic Lab.
Hugo B. Fisher.

alifornia Water Resources Center Contribution
o. 132, March, 1970. 143 p, 9 tab, 14 fig, 21 ref.
roject W-165.

escriptors: Tidal waters, *Estuaries, Numerical
odels, Model studies, Path of pollutants, *Water
ollution sources, Estuarine environment, Water
ollution effects, *Forecasting, Computer pro-
rams, Dispersion.
dentifiers: *Tidal hydraulics, Tidal velocity, Tidal
levation, Pollutant transport, Pollutant dispersion,
stuarine geometry.

A numerical model is presented in two parts; part one models the tidal hydraulics of an estuary and determines tidal velocities and elevations; part two models the transport and dispersion of pollutants. The only input required to the model is the tidal fluctuation of water surface at the estuary mouth and the geometry and frictional characteristics of the estuary. The model may be used to predict pollutant distributions from discharges in existing estuaries, or to determine effects on pollution caused by changing the estuarine geometry. The model is entirely predictive, it models both the hydraulics and pollutant transport without requiring field measurement of artificial coefficients. The model is intended as a tool in pollution studies; it can be used to study in advance of construction the effect of dredging, dike-building, or channel realignment, or the effect on an existing estuary of a new source of pollutant. It is hoped that the model will be found useful in the continuing effort to improve our environment.
W70-08168

THE PRACTICE OF WATER POLLUTION BIOLOGY,
Federal Water Pollution Control Administration, Washington, D.C. Div. of Technical Support.
For primary bibliographic entry see Field 05A.
W70-08197

WATER QUALITY EFFECTS OF LEACHING FROM SUBMERGED SOILS,
National Field Investigations Center, Cincinnati, Ohio.
Lowell E. Keup, Gerald D. McKee, Edward W. Raabe, and Richard W. Warner.
Journal of American Water Works Association, Vol 62, No 6, p 391-396, June 1970. 6 p, 6 fig, 2 tab.

Descriptors: *Leaching, *Organic soils, *Water quality control, *Reservoirs, *Reservoir design, Humus, Organic matter, Iron, Manganese, Water quality, Water chemistry.
Identifiers: Cape Fear River (NC).

Impounding water may result in the leaching of undesirable materials from the inundated soils. The Northeast Cape Fear River to be impounded in Kornegay Reservoir contained high color values (100+units), high concentrations of lignin (13.6 mg/l), and concentrations of nitrogen and manganese that might interfere with water uses. This water could leach additional quantities of lignin, iron, manganese, and total phosphorus from the leaf litter covering the reservoir site. Experiments indicated that iron and manganese were leached at a greater rate under anaerobic conditions. With clear waters, (color, 18 units), substantial increases in materials leached were observed in either aerobic or anaerobic waters. The one exception was manganese which decreased substantially in the aerobic waters. It is recommended that organic-rich materials, especially leaf litter, be removed or plowed into the soil to prevent leaching of excessive iron, manganese, and lignin to the water. If practical, organic rich soils such as muck should be removed or buried. In addition, provisions should be made for multi-level water supply intakes. (Knapp-USGS)
W70-08218

EVALUATION OF POTENTIAL ACID MINE DRAINAGE,
Carnegie-Mellon University, Pittsburgh, Pa.
For primary bibliographic entry see Field 05G.
W70-08234

CLASSIFICATION OF ORGANIC POLLUTION IN SURFACE WATERS,
Research Inst. for Industrial Water Treatment, Prague (Czechoslovakia).
For primary bibliographic entry see Field 05A.
W70-08236

CURRENT WATER QUALITY CONDITIONS AND INVESTIGATIONS IN THE UPPER POTOMAC RIVER TIDAL SYSTEM,
Federal Water Quality Administration, Annapolis, Md. Chesapeake Technical Support Lab.
Johan A. Aalto, Norbert A. Jaworski, and Donald W. Lear, Jr.
Federal Water Quality Administration, Chesapeake Technical Support Laboratory Technical Report No 41, May 1970. 38 p, 4 fig, 6 tab, 17 ref.

Descriptors: *Estuaries, *Water pollution effects, *District of Columbia, Tidal effects, Nutrients, Eutrophication, Water quality, Water pollution control, Surveys, Investigations, Path of pollutants, Sampling, Water analysis, Algae, Coliforms, Dissolved oxygen.
Identifiers: *Potomac River.

Based on data obtained by field investigations and from waste water treatment agencies in the Washington metropolitan area, a statement on current water conditions and investigations of the upper Potomac River tidal system was prepared and summarized. Fecal coliform densities are lower than in 1965 as a result of the increased chlorination of treated waste discharges since 1969. High fecal coliform densities were prevalent at times of high stream flow above the major wastewater discharges. These high densities can be attributed to a combination of land runoff from the upper Potomac basin, urban runoff, storm sewers and combined sewer overflows. Tributaries also contained very high fecal coliform densities at times. Extensive phytoplankton blooms were detected. Since the late 1930's the amount of phosphorus entering the Potomac has increased about tenfold and nitrogen increased about fivefold. The major shift toward nuisance blue-green algal growths appears to be related to increases in nitrogen and phosphorus, and not BOD (carbon). Most of the phosphorus which entered the tidal system from the upper basin, plus some from local waste water discharges, was adsorbed and deposited in the bottom sediments of the estuary. Dye and mathematical model investigations indicate that waste water assimilation and transport rates are very low. (Knapp-USGS)
W70-08248

PRELIMINARY ANALYSES OF THE WASTE WATER AND ASSIMILATION CAPACITIES OF THE ANACOSTIA TIDAL RIVER SYSTEM,
Federal Water Quality Administration, Annapolis, Md. Chesapeake Technical Support Lab.
For primary bibliographic entry see Field 05A.
W70-08249

A LAGRANGIAN METHOD FOR PREDICTING POLLUTANT DISPERSION IN BOLINAS LAGOON, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
Hugo B. Fischer.
U S Geological Survey Open-file report, December 31, 1969. 79 p, 12 fig, 1 tab, 13 ref, append.

Descriptors: *Dispersion, *Path of pollutants, *Bays, *Tidal effects, *California, Computer programs, Mathematical models, Water pollution control, Tides, Currents (Water), Tracers, Dye releases, Lagoons, Inlets (Waterways).
Identifiers: Bolinas Lagoon (Calif).

A numerical method and computer program are presented for use in predicting the movement and dispersion of a pollutant in a tidal embayment. The embayment geometry and the tidal cycle of water surface elevations at various interior points must be known. The computer program will generate the motion and dispersion of a concentrated slug of pollutant, or it will predict the concentration of pollutant at all points within the embayment resulting from a constant discharge at one point. The method was verified by predicting the dispersion of a slug of pollutant discharged near the mouth of Bolinas Lagoon, California. In field experiment, a slug of Rhodamine WT dye tracer dispersed in reasonable conformity to the numerical prediction. The numerical method was also used to predict the concentration distribution in Bolinas Lagoon resulting from a continuous addition of a pollutant at the location of the existing sewage outfall. A study was also made of the benefit resulting from detention of the pollutant during a two-hour period at low tide. In this case asignificant concentration reduction is observed in those portions of the lagoon which were previously the most seriously polluted. (Knapp-USGS)
W70-08254

EXPERIMENTAL DETERMINATION OF MAXIMUM PERMISSIBLE FERROCYANIDES (POTASSIUM FERROCYANIDE) CONCENTRATION IN NATURAL BODIES OF WATER,
R. D. Smirnova, S. M. Pavlenko, and Ye. M. Oleynik.
Translated from Russian: Available from the Clearinghouse in PB-185 824T, p 110-115, $3.00 in paper copy, $0.65 in microfiche. Included In: USSR Literature on Water Supply and Pollution Control, CFSTI, Vol 10, 1969, p 110-115.

Descriptors: *Water pollution, *Pollutants, *Analytical techniques, Methodology, Organoleptic properties, Organic compounds, Toxicity, Odor, Color, Taste, Biochemical oxygen demand.
Identifiers: *Ferrocyanide.

The maximum permissible potassium concentration ferrocyanide was established for potable water. Scattered and solar light, temperature of environment, reactions in the water and mixing factor were given special attention. The organoleptic threshold concentration of potassium ferrocyanide is 2.5 mg/l, the threshold concentration for the general sanitary regime is 25 mg/l, and the toxicological dose is 1.25 mg/l. Maximum permissible concentration for potassium ferrocyanide should be established on the basis of the sanitary-toxicological index. (Carstea-USGS)
W70-08288

SANITARY PROTECTION OF WATER BODIES AGAINST POLLUTION BY INDUSTRIAL WASTE WATERS: INDUSTRIAL POLLUTANTS OF WATER BODIES,
S. N. Cherkinskiy.
Translated from Russian. Available from the Clearinghouse in PB-185 824T, p 187-193, $3.00 in paper copy, $0.65 in microfiche. Included In: USSR Literature on Water Supply and Pollution Control, CFSTI, Vol. 10, 1969, p 187-193.

Descriptors: *Water pollution sources, *Pollutant identification, Water pollution, *Water pollution control, *Industrial wastes, Pollutants, Chemical wastes, Methodology, Analytical techniques, Water resources.

A collection of translations from USSR literature published under the title 'Industrial Pollutants of Water Bodies' contains 25 studies on the biological effects and hygienic significance of specific chemical industry pollutants. Several papers deal with scientific methodology and criteria used in experimental work for establishing maximum levels of harmful pollutants. This collection is addressed to public health physicians, hygienists, engineers, and technical personnel engaged in protecting water resources against pollution. (Carstea-USGS)
W70-08292

INVESTIGATIONS OF THE SUPPLY OF NUTRIENTS PROVIDED BY A PREDOMINANTLY AGRICULTURALLY UTILIZED WATERSHED WITH LAND SETTLEMENT (IN GERMAN),
H. Bernhardt, W. Such, and A. Wilhelms.
Munchner Beitrage zur Abwasser-, Fischerei- und Flussbiologie, 1969. Vol 16, p 59-118. 38 fig, 30 tab, 34 ref.

Descriptors: *Eutrophication, *Reservoirs, *Water pollution sources, Tributaries, Precipitation (Atmospheric), Runoff, Nitrogen, Phosphorus, Effluents, Domestic wastes, Agricultural watersheds, Farm wastes.
Identifiers: Wahnbach Reservoir (West Germany).

This voluminous report incorporates many previous findings of the senior author pertinent to the Wahnbach Reservoir, its hydrological and eutrophication features. In this paper primary attention is given to the two major factors of chemical pollution--nitrogen and phosphorus. The investigation disclosed that the larger part of nutrients, especially phosphorus, enriching the Wahnbach Reservoir, originates in agriculturally utilized areas, particularly numerous piles of animal manure. Only 40% of the annual quantity of phosphorus could be diverted from the reservoir by a combination of mechanical, biological, and chemical treatments. In the authors' opinion, the last statement is of decisive importance in planning the restoration measures for the area in question. (Wilde-Wisconsin)
W70-08356

THERMAL GRADIENTS IN RIVERS AND RESERVOIRS DUE TO HEATED PLANT EFFLUENTS,
Mississippi State Univ., State College. Water Resources Research Inst.
Adnan Shindala, and Melville S. Priest.
Available from the Clearinghouse as PB-193 022, $3.00 in paper copy, $0.65 in microfiche. Completion Report, June 1970. 20 p, 9 fig, 5 ref. OWRR Project A-037-MISS (1).

Descriptors: *Thermal pollution, *Heated effluents, Hydraulics, Rivers, Reservoirs, Thermal stratification, Estuaries, *Path of pollutants, Water pollution sources.
Identifiers: *Thermal gradients, *Calefaction, Cooling ponds.

The direction of heated effluents from large thermal power plants into stream and lakes has been a matter of public concern for some time, and the collection of prototype data related to the hydraulic aspects has taken on massive proportions. Unfortunately, most of the data are proprietary and not available for public analysis. The authors have endeavored to collect such data as are available to them for the initiation of steps toward generalization and the discussion of some of the more evident hydraulic considerations. The study is primarily concerned with rivers, including estuaries, with some interest in cooling ponds.
W70-08423

INFLUENCE OF LOG HANDLING PRACTICES ON WATER QUALITY,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05C.
W70-08476

RADIONUCLIDE ACCUMULATION IN COLUMBIA RIVER BIOTA,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
Donald R. Buhler.
In: Water Studies in Oregon; Oregon State University Water Resources Research Institute Fall Quarter 1969 Seminar WR012.69, Corvallis, p 41-54, January 1970. 14 p, 5 fig, 2 tab, 7 ref.

Descriptors: *Radioactive wastes, *Radioisotopes, *Columbia River, *Washington, *Nuclear powerplants, Path of pollutants, Water pollution effects, Fish, Safety, Toxicity, Public health, Standards, Waste disposal, Radioactive waste disposal.
Identifiers: Hanford (Wash).

The radionuclides released into the aquatic environment daily by the nuclear reactors at Hanford, Wash, were studied and found do not present a serious hazard to aquatic or terrestrial life living in or along the Columbia River. Maximum permissible levels of radioactivity released into the water are specified so that it is impossible for man to ingest sufficient quantities of fish or other radioactive species from the area to exceed permissible levels of radioactivity in the body. The absence of demonstrable hazardous effects on man or his environment during the 25 years of continuous safe release of radioactive wastes from the nuclear reactors at Hanford should provide some basis for an evaluation of the impact of a modern nuclear power plant which releases less than 0.02 percent as much radioactivity to the aquatic environment. (See also W70-08475). (Knapp-USGS)
W70-08478

WATERBORNE STYRENE IN A CRYSTALLINE BEDROCK AQUIFER IN THE GALES FERRY AREA, LEDYARD, SOUTHEASTERN CONNECTICUT,
Geological Survey, Hartford, Conn.
I. G. Grossman.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402 - Price $3.25. In: Geological Survey Research 1970, Chapter B, US Geological Survey Professional Paper 700-B, p B203-B209. 7 p, 3 fig, 1 tab, 12 ref.

Descriptors: *Path of pollutants, *Groundwater movement, *Aquifers, *Connecticut, *Organic wastes, Joints (Geology), Fractures (Geology), Water pollution sources.
Identfers: *Styrene.

Styrene, a synthetic hydrocarbon which is only slightly soluble in water, was readily waterborne in the Gales Ferry area, Connecticut in 1961-64. Following shallow burial in 1960, styrene moved downward with vadose water through thin glacial till into the bedrock aquifer, which consists in large part of schist and quartzite and in small part of granite gneiss. Movement from two contaminating sources to cones of depression at six domestic wells was principally westward and northward along foliation joints and cross joints. Maximum overall movement exceeded 300 feet. Removal of the sources of contamination produced water of satisfactory chemical quality in 2 years or less. (Knapp-USGS)
W70-08489

DOSAGE REQUIREMENTS FOR SLUG INJECTIONS OF RHODAMINE BA AND WT DYES,
Geological Survey, Washington, D.C.
F. A. Kilpatrick.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402 - Price $3.25. In: Geological Survey Research 1970, Chapter B, US Geological Survey Professional Paper 700-B, p B250-B253, 1970. 4 p, 3 fig, 2 ref.

Descriptors: *Tracers, *Dye releases, *Tracking techniques, Path of pollutants, Dispersion, Mixing, Streamflow, Discharge (Water), Stream gages.
Identifiers: Dye dosage.

Time-of-travel measurements, simulation studies of waste and thermal pollution, dispersion tests, and dilution type discharge measurements, in streams and estuaries, involve the slug injection of specific amounts of fluorescent dyes. Curves relating quantities of dye required for slug injections into streams are developed from data from nearly 500 field time-of-travel tests. Separate relationships are developed for Rhodamine BA and Rhodamine W[illegible] dyes. The application of the relationships is illu[illegible]trated by an example.
W70-08498

THE MAGNITUDE AND EXTENT OF SALI[illegible] WATER CONTAMINATION IN TH[illegible] CALOOSAHATCHEE RIVER BETWEEN I[illegible] BELLE AND OLGA, FLORIDA,
Geological Survey, Tallahassee, Fla.
Durward H. Boggess.
Florida Bureau of Geology Information Circul[illegible] No 62, Part 2, p 17-39, 1970. 23 p, 8 fig, 2 tab, [illegible] ref.

Descriptors: *Saline water intrusion, *Cana[illegible] *Locks, *Streamflow, *Florida, Mixing, Densi[illegible] currents, Water pollution sources, Sea wate[illegible] Chlorides, Path of pollutants.
Identifiers: Caloosahatchee River (Fla).

Repeated injections of salt water through the loc[illegible] chamber at the W. P. Franklin Dam causes [illegible] progressive increase in the chloride content [illegible] water in the fresh water reach of th[illegible] Caloosahatchee River during low-flow period[illegible] Vertical profiles in the contaminated reach of th[illegible] river show essentially the same chloride content [illegible] the water from the surface to a depth of about 1 [illegible] feet and consistently higher concentrations a[illegible] greater depths. The chloride content of the water i[illegible] the deep and shallow zones decreases with in[illegible] creased distance upstream from the dam. In th[illegible] deeper parts of the river channel, the upstrea[illegible] limit of water containing 250 mg/l of chlorides wa[illegible] 11.4 miles from the dam in May 1968. At shallow[illegible] depths, the upstream limit of water containing 250[illegible] mg/l of chlorides was 5.3 miles from the dam in[illegible] May 1967 and 4.7 miles from the dam in Apri[illegible] 1968. (See also W70-08516). (Knapp-USGS)
W70-08517

MERCURY CONTAMINATION IN THE NATU-[illegible] RAL ENVIRONMENT,
Bureau of Commercial Fisheries, Ann Arbor, [illegible] Mich.; and Dept. of Interior, Washington, D.C. Office of Library Services.
For primary bibliographic entry see Field 05A.
W70-08541

5C. Effects of Pollution

SENSITIVITY OF BENTHIC MICROFLORA TO [illegible] POLLUTION GRADIENTS,
Rhode Island Univ., Kingston. Graduate School of [illegible] Oceanography.
Nelson Marshall, Donald M. Skauen, and Candace A. Oviatt.
Available from the Clearinghouse as PB-192 853, $3.00 in paper copy, $0.65 in microfiche. Final Project Report (1970). 70 p, 9 ref. FWQA Project 18050DXU--6/70, Grant 1WP-01220.

Descriptors: Benthic flora, *Microorganisms, *Water pollution effects, Estuarine environment, *Productivity, Sedimentation, Environmental effects, Pollutants identification.
Identifiers: *Benthic microflora, Pollution gradients.

This program was initiated in June 1967 to evaluate relationships between the productive condition of the sediment environment and pollution effects normally experienced along a densely populated coastline. Specifically the work was designed to: (a) improve the methodology for measuring the productivity of the benthic microflora community; (b) determine the normal rate of productivity of the microflora community of shoal benthic environments, as indicated by the rate of 14C uptake by intact samples of samples; and (c) compare this norm with productivity in an area affected by heavy domestic pollution and an area affected by thermal addition. (Limited results were obtained for this objective.) Data are presented on the reliability

and variability of calculations of primary productivity.
W70-08164

PLANKTON COMMUNITY AND HYDRAULIC CHARACTERIZATION PRELIMINARY TO LAKE FLUSHING,
Washington Univ., Seattle. Dept. of Civil Engineering.
Eugene B. Welch, Ronald J. Buchanan, Ronald E. Nece, and Richard H. Bogan.
Available from the Clearinghouse as PB-192 760, $3.00 in paper copy, $0.65 in microfiche. Final report, October, 1969. 181 p, 11 tab, 32 fig, 14 ref, 3 append. FWQA Project 16010--10/9.

Descriptors: Eutrophication, *Plankton, Lakes, Standing crop, *Nutrients, Water quality, Water pollution effects, *Hydraulic models, Mathematical models, Water pollution control, Washington.
Identifiers: *Moses Lake (Washington), *Lake flushing, Flushing, Low-nutrient water.

The effect was evaluated of adding varying amounts of low-nutrient flushing water to one area of Moses Lake, a 6,500-acre highly eutrophic lake in eastern Washington. Cluster analysis of plankton data identified 6 sample groups and species groups. Temporal and spatial variations in community types and standing crops appear to be related to detention time, nitrate content, and available light. The effect of low-nutrient dilution water on lake plankton growth response indicated growth at 90% and 86% lake water. General agreement was obtained among 3 field techniques for determining time of travel through a section of upper Parker Horn. Dye studies, diurnal plankton sampling, and field observations indicate that southerly winds have a great effect on moving algae upstream into upper Parker Horn. Water movements in the lake could be simulated in a distorted Froude law hydraulic model. Removal of algae and nutrients by flushing procedures in Parker Horn and the lower lake would likely be more effective at night. Moses Lake behaves both biologically and hydraulically as though it were divided into several partially isolated regions. A tentative mathematical model has been set up for simulating the productivity and distribution of algae. Flushing Parker Horn with large slugs of low nutrient water may not be effective because of wind action transporting algae and their entrained nutrients back into the Horn together with nutrient regeneration from sediments.
W70-08166

THE PRACTICE OF WATER POLLUTION BIOLOGY,
Federal Water Pollution Control Administration, Washington, D.C. Div. of Technical Support.
For primary bibliographic entry see Field 05A.
W70-08197

WATER QUALITY BEHAVIOR IN RESERVOIRS,
Consumer Protection and Environmental Health Service, Cincinnati, Ohio.
James M. Symons.
For sale by Superintendent of Documents, US Government Printing Office, Wash, DC 20402 - Price $3.25. US Public Health Service Publication No 1930 (Compilation of Research Papers), Department of Health, Education, and Welfare, Cincinnati, Ohio, 1969. 616 p. Published by US Government Printing Office, Wash, DC.

Descriptors: *Water quality, *Reservoirs, *Eutrophication, *Limnology, Dissolved oxygen, Oxygen demand, Aeration, Mixing, Water pollution, Biological properties, Nutrients, Research and development, Organic wastes, Stratification.
Identifiers: Water storage effects.

The technical papers prepared from data collected for the project 'Influence of Impoundments and Controlled Releases on Water Quality,' from September 1962 through December 1966 are compiled. Research on this project was divided into two broad categories: (1) investigative research, designed to better understand reservoir water quality behavior; and (2) engineering research, designed to develop engineering methods for the control of reservoir water quality. Papers included in this Compilation cover a review of the literature on the project topic and a statement of research needs, and research on the dissolved oxygen budget in reservoirs, on the behavior of the nitrogen cycle in reservoirs, on the behavior of synthetic organics in stratified reservoirs, and on the use of artificial destratification as an engineering technique for managing and maintaining good quality water in reservoirs. A bibliography was compiled of papers relating to artificial destratification. (Knapp-USGS)
W70-08278

INCREASING THE RELIABILITY OF EXPERIMENTAL RESULTS ARRIVED AT IN STUDIES ESTABLISHING HYGIENIC STANDARDS FOR HARMFUL SUBSTANCES IN BODIES OF WATER,
For primary bibliographic entry see Field 05A.
W70-08285

DEPENDENCE OF THE EMBRYONIC DEVELOPMENT AND VIABILITY OF THE CARP ON THE TRACE ELEMENT ZINC,
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
V. I. Vladimirov.
Voprosy Ikhtiologii (Problems of Ichthyology) Vol 9, No 5, 1969, p 687-696. 27 ref. 3 fig, 4 tab.

Descriptors: Water pollution effects, *Carp, *Embryonic growth stage, *Viability, Heavy metals, Fish eggs, Fish physiology, Larval growth stage, Toxicity, Trace elements, Laboratory tests, Fertility.
Identifiers: Zinc, Embryonic development, *Zinc sulfate, Survival.

Zinc concentrated in very large amounts by carp eggs in the course of oogenesis has an adverse effect on embryonic development and on the viability of the larvae. The addition of zinc sulfate in amounts of 0.05 mg/liter in the early stages of embryogenesis improved the development and viability of the larvae on average. The same effect was also noted when larvae were exposed to the stated doses in the first 10-15 days after hatching, but the positive effect was weaker in this case. The reactions of embryos and larvae to the addition of zinc are largely dependent on zinc content in the eggs. (Sjolseth-Washington)
W70-08360

HEAT TOLERANCE OF CHANNEL CATFISH, ICTALURUS PUNCTATUS,
Arkansas Univ., Fayetteville. Dept. of Zoology.
Kenneth O. Allen, and Kirk Strawn.
Proceedings, 21st Annual Conference of the Southeastern Association of Game and Fish Commissioners, 1967, p 399-411. 4 figs, 2 tab. 15 refs.

Descriptors: Catfishes, Channel catfish, Acclimatization, *Heat resistance, Heated water, Thermal pollution, Thermal stress, Resistance, Lethal limit, Water pollution effects, Mortality, Fishkill, Fish physiology, Effects.
Identifiers: *Ictalurus punctatus, *Thermal tolerance, Survival, *Lethal effects.

Three lots of channel catfish, comprising tow size and age groups were tested for several factors affecting heat tolerance. Heat tolerance was apparently determined by genetic background, acclimation level, and to a lesser extent by age. Thermal history prior to acclimation and size did not appear to influence heat tolerance. The fingerling fish had the highest upper-lethal temperatures. However, at 'quickly lethal' temperatures older fish ahd greater resistance. The upper lethal temperatures for 44-57-day-old fish were approximately 36.6, 37.3, and 37.8 for 26.0, 30.0, and 34.0 acclimations. There appeared to be at least six lethal effects that tended to separate the fish into physiological populations on the basis of their heat resistance. Heat death may occur up to 13-3/4 days after initial exposure. High temperatures may indirectly cause mortalities over a still longer period of time by increasing the rate of metabolism beyond the fishes ability to consume food. (Sjolseth-Washington)
W70-08362

RESIDUES IN FISH, WILDLIFE, AND ESTUARIES - CHLORINATED HYDROCARBON PESTICIDES IN CALIFORNIA BAYS AND ESTUARIES,
California State Dept. of Fish and Game, Menlo Park, Calif. Marine Resources Operations.
For primary bibliographic entry see Field 05A.
W70-08363

FIELD TRIALS OF ANTIMYCIN AS A SELECTIVE TOXICANT IN CHANNEL CATFISH PONDS,
Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab.
Ralph M. Burress, and Charles Luhning.
Investigations in Fish Control, No. 25, 1969. 11 p, 8 tab, 4 ref.

Descriptors: *Antimycin A, *Channel catfish, Fish control agents, Fish farming, Fish harvest, Fish management, Sunfishes, Shiners, Cost-benefit analysis, Commercial fish, Degradation, Fishkill, *Evaluation, Pesticides.
Identifiers: *Antimycin, Scalefishes, *Selective toxicant.

Antimycin effectively and economically controlled heavy infestations of green sunfish and golden shiners from channel catfish ponds at a Mississippi fish farm. An initial application of 5 p.p.b. of antimycin in two ponds and 7.5 p.p.b. in the third pond eliminated nearly 99 percent of the scalefishes. A followup treatment of 10 p.p.b., 4 days later, further reduced these populations with no apparent effect on yearling catfish. At harvest, three untreated ponds produced 1,474 pounds of scalefishes or an average of 389 pounds per acre, yielded 27.4 percent or 1,155 fewer catfish than the three treated ponds, and contained 1,183 undersize fish or nearly three times as many that were too small for table use. Treated ponds produced an additional 1,015 pounds of fish worth $507.50, while antimycin cost only $145.79. (See also W70-08365) (Sjolseth-Washington)
W70-08364

LABORATORY STUDIES ON ANTIMYCIN A AS A FISH TOXICANT,
Bureau of Sport Fisheries and Wildlife, LaCrosse, Wis. Fish Control Lab.
Bernard L. Berger, Robert E. Lennon, and James W. Hogan.
Investigation in Fish Control, No. 26, 1969. 20 p, 17 tab, 1 fig, 17 ref.

Descriptors: *Antimycin A, *Bioassay, Water temperature, Hydrogen ion concentration, Laboratory tests, Fish control agents, Fish management, Fish kill, *Toxicity, Mortality, *Freshwater fish, Channel catfish, Rainbow trout, Resistance, *Piscicides, Turbidity, Lethal limit.
Identifiers: *Water quality effects, Fish toxicant, *Selective toxicant, Sensitivity, Detoxification.

Liquid and sand formulations of antimycin A were tested in laboratory waters of various temperature, hardness, pH, and turbidity against 31 species of freshwater fish of various sizes and life stages. Each formulation of toxicant was lethal under all water conditions to fish eggs, fry, fingerlings, and adult fish. Trouts are the most sensitive and catfishes the least sensitive. Of the 31 species, 24 succumb to 5 p.p.b. or less of the toxicant; only certain catfishes survive 25 p.p.b. The order of toxicity to various species of fish suggests that antimycin has possibilities for selective or partial control of certain un-

wanted fish. Antimycin is more active in warm water than in cold. It is slightly more active in soft water than in hard; it is more active and persists far longer in water at pH 5 to 8 than at/pH 9 or 10. The results contributed to registration of antimycin A in Fintrol-5 formulation as a fish toxicant. (See also W70-08366) (Sjolseth-Washington)
W70-08365

FIELD TRIALS OF ANTIMYCIN A AS A FISH TOXICANT,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
Philip A. Gilderhus, Bernard L. Berger, and Robert E. Lennon.
Investigations in Fish Control, No. 27, 1969. 20 p, 18 ref, 16 tab.

Descriptors: *Antimycin A, *Piscicides, *On-site tests, Degradation, Fish control agents, Hydrogen ion concentration, Resistance, Water temperature, *Fish management, Fishkill, Evaluation, Toxicity.
Identifiers: Water quality effects, *Fish toxicant, Detoxification, *Selective toxicant.

Antimycin A was subjected to field trials as a fish toxicant in 20 ponds and lakes and 5 streams in the East, Midwest, and West of the United States. Ten parts per billion or less of the toxicant were effective against most of the 54 species of fish we encountered, including carp, suckers, and green sunfish. Differences in sensitivity among fish suggest possible use of antimycin as a selective toxicant. The efficacy of the toxicant is influenced by pH and water temperature, with slightly higher concentrations necessary at high pH or in cold water. Antimycin does not repel fish, and its toxic action on fish appears to be irreversible. It degrades rapidly, usually within a week. Fishkilling concentrations have little or no effect on other aquatic animals. (See also W70-08367). (Sjolseth-Washington)
W70-08366

USE OF ANTIMYCIN FOR SELECTIVE THINNING OF SUNFISH POPULATIONS IN PONDS,
Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab.
Ralph M. Burress, and Charles W. Luhning.
Investigations in Fish Control, No 28, 1969. 9 p, 3 tab, 5 ref.

Descriptors: *Antimycin A, *Piscicides, *Sunfishes, Georgia, *Fish control agents, Cost analysis, Fish management, Fish kill, Toxicity, Fish conservation, Water temperature, Fish populations, On-site tests.
Identifiers: *Antimycin, Fish toxicant, Selective toxicant, Selective thinning, Effective concentration, Bluegills.

Selective removal of bluegills, redear sunfish, and redbreast sunfish was accomplished in six soft-water ponds in west central Georgia by applications of 0.4, 0.6, 0.8, and 1.0 parts per billion (p.p.b.) of antimycin in the Fintrol-5 formulation. Successful treatments were made during winter, spring, and late summer at water temperatures raning from 46 deg to 75 deg F. and under a wide variety of weather conditions. The 0.4-p.p.b. treatment made at 75 deg F. removed 2.9 pounds per acre of largemouth bass less than 6 inches long and 69 pounds per acre of all sizes of sunfishes. The 0.6 p.p.b. applied at 47 deg F. reduced the numbers of bluegills less than 4 inches in length by about half with very little effect on largemouth bass or larger bluegills. Bass, bluegills, and redear sunfish which survived multiple exposures to antimycin in concentrations up to 1.0 p.p.b. were able to reproduce normally. (See also W70-08364) (Sjolseth-Washington)
W70-08367

THE SUCCESSION OF THE BOTTOM FAUNA COMMUNITIES IN POLLUTED ESTUARINE HABITATS, (PRELIMINARY REPORT),
Institute of Marine Research, Helsinki (Finland). Biology Div.
Pauli Bagge.
Limnologica, Vol. 7, No. 1, 1969, p. 87-94. 2 tab, 5 fig, 7 ref.

Descriptors: *Succession, *Benthic fauna, *Biological communities, *Water pollution effects, Estuarine environment, Salinity, Dissolved oxygen, Oligochaetes, Environmental effects, Distribution patterns, Dominant organisms, Climatic climax.
Identifiers: Sweden, *Polluted estuaries, Baltic-Skagerak region, *Salinity zones chironomids, Capitellids, Spionids, Secondary succession, *Climax communities.

The benethic faunae of five polluted estuaries situated in the Baltic-Skagerak region have been compared. The localities represent a gradation from oligohaline to mixoeuhline conditions. In all of the salinity zones compared, wherever the oxygen content of the bottom water is low limivorous or selective deposit feeding species predominate in the type species groups. In the oligohaline and /3-mesohaline zones such species are mainly oligochaetes and chironomids, while in a more saline environment these are replaced by capitellids and spionids. The secondary succession of the benthic animal communities caused by pollution was shown to be a rapid process, especially in localities where the exchange of water is limited. (Sjolseth-Washington)
W70-08368

DISTRIBUTION OF MERCURY IN WATER, BOTTOM MUD AND AQUATIC ORGANISMS OF MINAMATA BAY, THE RIVER AGANO AND OTHER WATER BODIES IN JAPAN,
Freshwater Fisheries Research Lab., Tokyo (Japan).
For primary bibliographic entry see Field 05A.
W70-08369

THE EFFECTS OF SULFIDE PULP WASTES ON THE GROWTH OF MARINE PHYTOPLANKTON,
Kagawa Univ., Takamatsu (Japan). Faculty of Agriculture.
Tomotoshi Okaichi, and Akitaka Yaguy.
Bulletin of Plankton Society of Japan, Vol 16, No. 2, p 126-132, Dec. 1969. 2 tab, 3 fig, 7 ref.

Descriptors: *Pulp wastes, Water pollution effects, *Growth rates, Chemical oxygen demand, Chemical wastes, Waste identification, Sulfite liquors, Chemical analysis, Phytoplankton, Chlorella, Lignins, Nutrient requirements.
Identifiers: *Enterptiella, Cyclotella, Lignosulfonic acid, *Prorocentrum triestinum, *Sulfide pulp liquors.

The authors described the culture of marine phytoplankton with sulfide pulp wastes diluted with either sea water or artificial media. They found that sulfide pulp wastes diluted 250 to 500 times were effective in promoting the growth of Euterptiella sp. and Prorocentrum triestinum. The pulp wastes were fractionated with ion exchange resins in order to obtain the active substances. (Sjolseth-Washington)
W70-08371

GLENODININE, AN ICHTHYOTOXIC SUBSTANCE PRODUCED BY A DINOFLAGELLATE, PERIDINIUM POLONICUM (In Japanese),
Tokyo Univ. (Japan). Lab. of Marine Biochemistry.
Yoshiro Hashimoto, Tomotoshi Okaichi, Le Dung Dang, and Tamao Noguchi.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 34, No. 6, 1968. p. 528-534, 7 figs, 1 tab, 8 refs.

Descriptors: Water pollution sources, Water pollution effects, Dinoflagellates, Fishkill, Fish toxins, Bioassay, Aquatic algae, *Algal toxins, Killifishes, *Toxicity, Isolation.
Identifiers: Lake Sagami, Japan, *Glenodinine, *Peridinium polonicum, Plankton blooms.

In September 1962, extensive water blooms c dinoflagellate identified as Peridinium polonicu accompanied by mass mortality of fish, occurre Lake Sagami near Tokyo. An attempt was made isolate the suspected ichthyotoxic substance fr the plankton collected from the lake. The su stance was confirmed to be an alkaloid and to co tain a sulfhydryl radical. The authors designate as glenodinine. Bioassays showed glenodinine to extremely toxic to both freshwater and mari fishes. (Sjolseth-Washington)
W70-08372

FISH POPULATIONS AND AQUATIC CONDITIONS IN POLLUTED WATERS IN LOUISIANA,
Louisiana Wild Life and Fisheries Commission.
James T. Davis.
Louisiana Wild Life and Fisheries Commissi (Fisheries Section), (Bulletin 1-1960) 1960, 121 68 tab, 21 figs. Dingell-Johnson Project F-4-R.

Descriptors: Fish populations, Aquatic enviro ment, *Water pollution effects, Pulp wastes, Lou siana, *On-site investigations, *Water analys Water chemistry, Water quality, Domestic waste Fish food organisms, *Benthos, Fish reproductio Fish migration, Comparative productivity, Bioa say, Taste, On-site data collections.
Identifiers: Ouachita River, Louisiana.

The Ouachita River in Louisiana was studied fo fish populations and aquatic conditions in its po luted waters to devise a system of surveying po luted areas so that data needed to establish workable effluent discharge compatable with fis management could be maintained. Fish popula tions, benthic organisms, fish stomach sample reproduction, bioassays of selected effluents, an flesh taste tests were examined and evaluated determine the effects of pollution on fish. (Sjolseth Washington)
W70-08373

ORGANOCHLORINE PESTICIDES IN THE ENVIRONMENT,
Bureau of Sport Fisheries and Wildlife, Laurel, Md Patuxent Wildlife Research Center.
Lucille F. Stickel.
For sale by the Superintendent of Documents, U.S Gov't. Printing Office, Washington, DC, 20402- Price: $0.40. U.S. Bureau of Sport Fisheries an Wildlife; Special Scientific Report-Wildlife No 119, 1968. 32 p, 4 tab, 226 refs.

Descriptors: *Chlorinated hydrocarbon pesticides *Pesticide toxicity, *Pesticide residues, Pesticide kinetics, Pesticide drift, Pesticide removal, Water pollution effects, Monitoring, Aquatic environment, Animal physiology, Animal behavior, Enzymes, Mortality, DDT, Ecosystems.
Identifiers: *Pesticide effects, *Research needs Residue monitoring, Hormones.

Highest concentrations generally occur in carnivorous species. Thus predatory and fish-eating birds ordinarily have higher residues than do herbivores. Any segment of the ecosystem receives various amounts and kinds of pesticides at irregular intervals. The different animals absorb, detoxify, store, and excrete pesticides at different rates. Different degrees of magnification of pesticide residues by living organisms in an environment are the practical result of many interactions that are far more complex than implied by the statement of magnification up the food chain. Direct mortality of wild animals as an aftermath of recommended pesticide treatments has been recorded in the literature of numerous countries. The impact of these new components of the environment has appeared as death, reproductive impairment, disruption of species balance, and behavioral alteration, but the overall effects on the environment have not been determined. Research should be aimed at interpretation of the significance of pesticide residues to survival and reproduction, to assessment of levels of pesticides in critical environments, and to the kinetics of pesticides in in-

viduals and the ecosystem. (Sjolseth-Washing-
n)
70-08374

TUDIES ON THE METABOLISM OF PEN-
ACHLOROPHENATE, A HERBICIDE, IN
QUATIC ORGANISMS--I. TURNOVER OF AB-
ORBED PCP IN TAPES PHILIPPINARIUM. (In
apanese),
yushu Univ., Fukuoka (Japan). Faculty of
griculture; and Tokyo Univ. of Fishery (Japan).
unio Kobayashi, Hiroshi Akitake, and Tetuo
omiyama.
ulletin of the Japanese Society of Scientific Fishe-
ies, Vol 35, No. 12, 1969, p 1179-1183, 3 figs, 1
ab, 8 refs.

escriptors: Carbon radioisotopes, Shellfish, Her-
icides, *Absorption, Degradation, *Toxicity,
Mode of action, Tracers, *Animal metabolism,
nalytical techniques, Distribution, Distribution
atterns, Biodegradation.
dentifiers: *Pentachlorophenate, *Tapes philip-
inarium, Bojanus organ, Liver, *Tissue analyses,
istribution rate, Carbon-14.

n regards to the toxicity of PCP to a shell-fish,
apes philippinarum, it has previously been re-
orted that the PCP levels higher than 0.1 ppm was
ethal. The paper deals with the turnover of ab-
orbed PCP in the shell-fish using C-labelled PCP.
PCP dissolved in the media was rapidly absorbed
by the shell-fish and distributed into the various tis-
sues, especially the Bojanus' organ and the liver,
and then quickly eliminated, presumably from the
Bojanus' organ. It was also revealed that most of
the accumulated PCP in the tissues were undecom-
posed and were either free or in the bound form.
(Sjolseth-Washington)
W70-08375

THERMAL POLLUTION - BIOLOGICAL EF-
FECTS, A REVIEW OF THE LITERATURE OF
1969,
Battelle-Northwest, Richland, Wash.
Charles C. Coutant.
To be published in Journal of Water Pollution Con-
trol Federation, Review of Literature of 1969 on
Waste Water and Water Pollution Control, June
1970. Battelle Memorial Institute, Pacific
Northwest Laboratory Report SA-3255, 1970. 90
p, 200 refs, 2 appendices, AEC Contract AT (45-
10-1830).

Descriptors: *Reviews, *Thermal pollution,
*Water pollution effects, Aquatic animals, Aquatic
plants, Thermal water, Bibliographies, On-site in-
vestigations, Biogeography, Resistance, Reproduc-
tion.
Identifiers: *Literature review, Synergism,
Polymorphism, Temperature selection.

This paper is a review of the literature of 1969 on
the biological effects of thermal pollution. Two
hundred articles were mentioned and these were
grouped into such basic categories as site studies,
biogeography, synergism, resistance, reproduction,
polymorphism, growth, temperature selection,
physiology, primary production, beneficial uses,
etc. Author's addresses were given to facilitate
requests for reprints. (Sjolseth-Washington)
W70-08376

THE TOXIC EFFECT OF PEN-
TACHLOROPHENATE, A HERBICIDE, ON
FISHERY ORGANISMS IN COASTAL WATERS
-V. (In Japanese),
Kyushu Univ., Fukuoka (Japan). Faculty of
Agriculture; and Tokyo Univ. of Fishery (Japan).
Junio Kobayashi, Takeaki Kurokawa, and Tetuo
Tomiyama.
Bulletin, Japanese Society of Scientific Fisheries
Vol. 35, No. 2, 1969, p 206-210. 7 figs, 8 refs.

Descriptors: Shellfish, Herbicides, *Bioassay, Tox-
icity, *Salinity, *Resistance, Effects, *Mortality,
Seasonal.
Identifiers: *Pentachlorophenate, *Tapes philip-
pinarum, *Low salinity sea water, Seasonal varia-
tion.

This paper deals with the relationship between the
toxic effects of PCP and/or the diluted sea water on
the shell-fish. The toxic threshold of the diluted sea
water to the shell-fish was in the vicinity of 7% in
the chlorinity at 25 deg C. In the higher chlorinity
than 7% the toxicity of PCP increased according to
the increase in concentration more than 0.1 ppm.
In the lower chlorinity than 7%, however, the tox-
icity of PCP, even at 0.3 ppm level, was obscured
under the arising toxicity of the lower salinity. The
preculture in a diluted sea water of 5% chlorinity
did not promote the toxicity of PCP, at 0.2 and 0.3
ppm level, to the shell-fish. The resistance of the
shell-fish to a low salinity sea water or PCP
changed seasonally during the experiments from
July 24th to Oct 9th. Therefore, the experiment on
the toxic effect of PCP to the shell-fish must be
done at the same time when the shell-fish is
damaged by PCP used in the fields. (Sjolseth-
Washington)
W70-08377

STUDIES ON THE METABOLISM OF PEN-
TACHLOROPHENATE, A HERBICIDE, IN
AQUATIC ORGANISMS -III. ISOLATION AND
IDENTIFICATION OF A CONJUGATED PCP
YIELDED BY A SHELL-FISH, TAPES PHILIP-
PINARUM (In Japanese),
Kyushu Univ., Fukuoka (Japan). Faculty of
Agriculture; and Tokyo Univ. of Fishery (Japan).
For primary bibliographic entry see Field 05A.
W70-08378

STUDIES ON THE METABOLISM OF PEN-
TACHLOROPHENATE, A HERBICIDE, IN
AQUATIC ORGANISMS -II. BIOCHEMICAL
CHANGE OF PCP IN SEA WATER BY DETOXI-
CATION, MECHANISM OF TAPES PHILIP-
PINARUM (In Japanese),
Kyushu Univ., Fukuoka (Japan). Faculty of
Agriculture; and Tokyo Univ. of Fishery (Japan).
For primary bibliographic entry see Field 05A.
W70-08379

TOXICITY OF YELLOW PHOSPHORUS TO
HERRING (CLUPEA HARENGUS), ATLANTIC
SALMON (SALMO SALAR), LOBSTER
(HOMARUS AMERICANUS), AND BEACH
FLEA (GAMMARUS OCEANICUS),
Fisheries Research Board of Canada, St. Andrews
(New Brunswick).
V. Zitko, D. E. Aiken, S. N. Tibbo, K. W. T. Besch,
and J. M. Anderson.
Journal of the Fisheries Research Board of Canada,
Vol 27, p 21-29, 1970. 3 fig, 2 tab, 6 ref.

Descriptors: *Phosphorus, Atlantic salmon, Her-
rings, Lobsters, *Bioassay, *Lethal limit, *Toxicity,
Fishkill, Fish physiology, Oxidation, Animal
physiology, Water pollution effects.
Identifiers: *Yellow phosphorus, Beach flea, Gam-
marus Oceanicus, Hemolysis.

Yellow phosphorus is extremely toxic to aquatic
life. In herring, salmon, and lobster, the toxic effect
of phosphorus is irreversible and probably cumula-
tive. For herring LT50 (hours) = 300/C0.87, where
C = /u g/liter of phosphorus. No clear indications of
an incipient lethal level were found, an LT50 being
obtained even at a concentration of 2.5 /ug/liter.
Incipient lethal levels of yellow phosphorus for
lobster, salmon, and beach flea are 40 ug/liter, 18
ug/liter, and 304 mg/liter, respectively. Poisoned
fish turn red and show signs of extensive hemolysis.
Blood of lobster congeals, and after death the
thorax may be filled with thick gel and the heart
grossly distended. For lobster, LT50 (hours) =
300-0.17x, where x = product of phosphorus con-
centration and exposure time (ug days/liter). The
oxidation of dispersions of yellow phosphorus in
water is kinetically a first-order reaction with hald-
life of 2-7.5 hr. The absorption of yellow
phosphorus on a solid support such as bottom mud
substantially decreases the rate of oxidation. (Sjol-
seth-Washington)
W70-08380

EFFICACY OF QUINALDINE AS AN
ANESTHETIC FOR SEVEN SPECIES OF FISH,
Bureau of Sport Fisheries and Wildlife, La Crosse,
Wis. Fish Control Lab.
Richard A. Schoettger, and Arnold M. Julin.
Investigations in Fish Control, No. 22, 1969, 9 p, 4
tab, 18 ref.

Descriptors: *Evaluation, Rainbow trout, Brown
trout, Brook trout, Channel catfish, Bass,
*Equilibrium, *Fish behavior, Fish physiology, Fish
management, Toxicity, Water chemistry, Hydrogen
ion concentration, Fish eggs, Laboratory tests.
Identifiers: *Quinaldine, *Anesthetic, Bluegill,
Drug, Narcosis, *Efficacy.

Quinaldine was tested as an anesthetic for rainbow
trout, brown trout, brook trout, lake trout, channel
catfish, bluegill, and largemouth bass. In general 15
to 70 ppm of the drug induces total loss of equilibri-
um in fish within two minutes. Efficacy is in-
fluenced by acid pH and for some species, by tem-
perature, but not by water hardness, age of quinal-
dine solutions, or repeated exposures of fish to
quinaldine. Assets include rapid action and pro-
longed maintenance of anesthesia, but anethetized
fish retain a degree of reflex responsiveness which
may interfere with stripping, delicate surgical
operations, and blood collection. The drug is harm-
less to fertilized rainbow trout eggs at concentra-
tions and exposure time normally encountered in
spawning operations. (See also W70-08382). (Sjol-
seth-Washington)
W70-08381

QUINALDINE AS AN ANESTHETIC FOR
BROOK TROUT, LAKE TROUT, AND ATLAN-
TIC SALMON,
Maine Dept. of Inland Fisheries and Game, Au-
gusta.
David O. Locke.
Investigations in Fish Control, No. 24, 1969. 4 p, 1
fig, 6 refs.

Descriptors: Atlantic salmon, Brook trout, Lake
trout, *Evaluation, *Resistance, Fish behavior,
Fish management, Laboratory tests, Cost com-
parisons, Fish physiology.
Identifiers: *Quinaldine, *Anesthetic, *Sensitivity,
*Recovery, MS-222, Water temperature effects.

Quinaldine (2-methylquinoline) was an effective
anesthetic for yearling Atlantic and landlocked sal-
mon and book and lake trout in waters ranging
from 10 to 40 ppm total hardness and temperatures
ranging from 36 deg to 40 deg F. and from 47 deg
to 59 deg F. Lake trout were more sensitive than
the other species tested. In tests, anesthetization
and recovery rates for five concentrations (5, 10,
15, 20 and 25 ppm) at both temperatures (10 ppm)
was generally satisfactory for lake trout. A concen-
tration of 15 ppm was satisfactory for marking and
general handling of salmon and brook trout. Quin-
aldine is one twenty-fourth as expensive as MS-222
at 1:12,000, and in view of the results the author
feels this drug warrants wider use as a fish
anesthetic. (See also W70-08381). (Sjolseth-
Washington)
W70-08383

RELATIONSHIP BETWEEN SEA WATER AND
BOTTOM CONDITION AND MECHANISM OF
FISHERIES PRODUCTION IN ESTUARINE
AREAS (In Japanese). WITH SPECIAL
REFERENCE TO THE DETERIORATION OF
PEARL OYSTER FARM,
Mie Prefectural Univ., Tsu (Japan). Faculty of
Fisheries.
Fukuzo Uyeno.
Bulletin Japanese Society of Fisheries Oceanog-
raphy, Special Number (Prof. Uda's Commemora-
tive Papers), 1969. p. 193-196. 1 fig, 22 refs.

Descriptors: *Bottom sediments, Estuarine environment, Commercial shellfish, Oysters, *Deterioration, *Aquaculture, *Cycling nutrients, Hydrogen sulfide, Water quality, Water quality control, Stagnant water.
Identifiers: *Pearl oysters, *Environmental deterioration, Over-culture.

This paper deals with the deterioration of pearl oyster farms by over-culture, from a viewpoint of circulation of nutrient substances in the farm water in a rather closed area. The deterioration is environmentally observed as appearances of low oxygen water, hydrogen sulfide poisoning, anaerobic bottom mud, etc. These happen quite suddenly in July and September by the stagnation of water after a long rain and a neap tide. At this time many organic substances and inorganic nutrient salts are supplied to the water from superficial bottom mud and this consumes oxygen. Originally the organic substances are pearl oyster faeces and dead phytoplankton. Therefore, water exchange near the bottom is an important problem. It is becoming clear that there are some qualitative differences for the growth of pearl oysters among the estuarine environments, such as chlorophyll content of water, phaeophytin content of superficial bottom mud and so on. Methods to artificially recover such deteriorated farms were tried from various view points, especially by accelerating the bottom water exchange. (Sjolseth-Washington)
W70-08384

TYPICAL FISH MORTALITY RATES IN EASTERN LAKE ERIE,
State Univ. Coll., Fredonia, N.Y.
Linda A. Tomkiewicz.
Lake Erie Environmental Studies, Technical Data Report, Number 4, April 1970, 15 p, 5 fig, 9 ref.

Descriptors: *Lake Erie, *Fishkill, Mortality, Smelts, Bass, Bullheads, Great Lakes, On-site data collections, *Water pollution effects, Water pollution sources, Fish diets, Carp, Commercial fishing, Sport fishing, Fish populations, Yellow perch.
Identifiers: *Seasonal mortality variations, Alewife.

This study was conducted to establish a base line of natural fish mortalities in eastern Lake Erie throughout a yearly cycle. Seasonal variations in mortality rate indices are shown graphically for the eight most common species (smelt, black bullheads, white suckers, sheepshead, yellow perch, white bass, smallmouth bass, and rock bass). No direct cause for the mortality could be given although the author stated possible causes as predation, diseases and parasitism, pollution, and physical damage caused by man. Most causes of high fish mortality rates were related to commercial and sports fishing activity. The need for further research is stated. (Sjolseth-Washington)
W70-08385

THE EFFECTS OF SUSPENDED AND DEPOSITED SEDIMENTS ON ESTUARINE ORGANISMS; AN ANNOTATED BIBLIOGRAPHY OF SELECTED REFERENCES,
Maryland Univ., Solomons. Natural Resources Inst.
J. Albert Sherk, Jr., and Eugene L. Cronin.
Natural Resources Institute of the University of Maryland. Reference No. 70-19, April, 1970. 62 p, 179 ref. Contract No. DACW73-70-C-0013 by U.S. Army Corps of Engineers.

Descriptors: *Bibliographies, *Water pollution effects, *Sediments, *Bottom sediments, *Suspended load, *Estuarine environment, *Abstracts, Mollusks, Crustaceans, Benthic fauna, Annelids, Water quality, Disposal, Primary productivity.
Identifiers: *Annotated bibliographies, *Estuarine organisms, Literature reviews.

This annotated bibliography was prepared by screening approximately 1200 published and unpublished articles, papers, and books. Abstracts of 161 references are presented for all papers on the effects of suspended loads and deposited sediments on estuarine organisms. Articles are classified into 9 categories (Annelid worms, crustaceans, benthic species, engineering activities, mollusks, offshore disposal, fish, primary production, and sediment effects on water quality). Also included is a list of 18 references constituting a bibliography of bibliographies. (Sjolseth-Washington)
W70-08386

THERMAL GRADIENTS IN RIVERS AND RESERVOIRS DUE TO HEATED PLANT EFFLUENTS,
Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 05B.
W70-08423

LIMNOLOGICAL CONDITIONS IN VOLTA LAKE, THE GREATEST MAN-MADE LAKE OF AFRICA,
Ghana Academy of Sciences, Accra. Inst. of Aquatic Biology.
For primary bibliographic entry see Field 02H.
W70-08445

ESTUARINE RADIOECOLOGY - A BIBLIOGRAPHY OF REPORT LITERATURE,
Department of the Interior, Washington, D.C. Office of Library Services.
For primary bibliographic entry see Field 10.
W70-08470

INFLUENCE OF LOG HANDLING PRACTICES ON WATER QUALITY,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
Frank D. Schaumbury.
In: Water studies in Oregon, Oregon State University Water Resources Research Institute Fall Quarter 1969 Seminar WR012.69, Corvallis, p 1-9, January 1970. 9 p, 7 fig.

Descriptors: *Water pollution sources, *Lumbering, *Wood wastes, Bark, Oxygen demand, Lignins, Dissolved oxygen, Toxicity, *Water pollution effects.
Identifiers: Log storage, Floating logs, Log handling.

Current logging and log handling practices contribute measurably to the pollution of natural waters in the Pacific Northwest. The significance of this contribution, however, must be carefully evaluated in each location where logging operations are underway. Logs held in water storage release measurable quantities of soluble substances to the holding water. Some of the substances add color to the water and some provide a food source for bacteria and other microorganisms ever present in the water. As more food is made available by this 'leaching' or diffusion process, more dissolved oxygen is consumed by the active microorganisms. If an excessive quantity of food material enters the water, the dissolved oxygen concentration in the water may be reduced below the minimum level required by fish and other aquatic life. Sunken bark forms a benthic deposit which provides a food source for microorganisms. The decomposition of bark creates a demand for dissolved oxygen from the overlying water. (See also W70-08475). (Knapp-USGS)
W70-08476

RADIONUCLIDE ACCUMULATION IN COLUMBIA RIVER BIOTA,
Oregon State Univ., Corvallis. Environmental Health Sciences Center.
For primary bibliographic entry see Field 05B.
W70-08478

MERCURY CONTAMINATION IN THE NATURAL ENVIRONMENT,
Bureau of Commercial Fisheries, Ann Arbor, Mich.; and Dept. of Interior, Washington, D.C. Office of Library Services.
For primary bibliographic entry see Field 05A.
W70-08541

5D. Waste Treatment Processes

A GENERALIZED COMPUTER MODEL FO STEADY-STATE PERFORMANCE OF THE A TIVATED SLUDGE PROCESS,
Robert A. Taft Water Research Center, Cincinn Ohio.
Robert Smith, and Richard G. Eilers.
Available from the Clearinghouse as PB-192 77 $3.00 in paper copy, $0.65 in microfiche. Wa Pollution Control Research Series, October, 19 80 p, 5 tab, 43 fig, 41 ref, 3 append. FWQA Proj 17090--10/69.

Descriptors: *Activated sludge, *Model studi *Computer models, *Computer programs, Math matical models, Waste water treatment, Aeratic Biodegradation, Biological treatment, Nitrificatic Oxygen requirements, Oxidation, Dissolved c ygen.

Mathematical models used to represent the a tivated sludge process are examined; means analysis and computation of the differences a similarities between models are investigated. Tw digital computer programs have been develope The first program, the Continuous Steady State A tivated Sludge (CSSAS) is a steady state model the conventional activated sludge process flexib enough to simulate any of the proposed model The second digital program Fill and Draw A tivated Sludge (FADAS) attempts to simulate th biological activity in a fill and draw bench exper ment in which activated sludge is mixed with sub strate in any proportions. The FADAS progra which has not been validated will be useful in in terpretation of bench scale fill-and-draw exper ments. The CSSAS program represents the mo complete state-of-the-art computational procedur for quasi-steady-state performance of the activate sludge process but some important questions rela ing to design and operation of the process remai unresolved. However, further experimentatio should ultimately result in a thoroughly reliabl design tool.
W70-08165

STUDIES ON LIMESTONE TREATMENT O ACID MINE DRAINAGE, OPTIMIZATION AN DEVELOPMENT OF IMPROVED CHEMICA TECHNIQUES FOR THE TREATMENT O COAL MINE DRAINAGE.
Bituminous Coal Research, Inc., Monroeville, Pa.

Available from the Superintendent of Documents U.S. Gov't Printing Office, Washington, D.C. 20402-Price $1.25. Water Pollution Contro Research Series, DAST-33, January, 1970. 96 p, 2 tab, 29 fig, 22 ref. FWQA Project 14010 EIZ-- 1/70.

Descriptors: *Coal mine wastes, *Neutralization *Oxidation, *Sludge treatment, *Acid mine drainage, Limestones, Ferrous iron, Electrophoresis, Coagulation, Waste water treatment.
Identifiers: Magnetic sludges, Sludge removal *Limestone treatment.

Four actual coal mine waters have been neutralized with limestone both on a batch scale and by utiliz ing a continuous flow apparatus. Variations in treatment procedure were necessary depending on the characteristics of the individual waters. A standarized test was established to evaluate the reactivity of the limestones. The following variables are of importance in evaluating limestones for coal mine water neutralization: (a) particle size, (b) Ca and Mg content, and (c) surface area. Ferrous iron oxidation has been accomplished with both synthetic and actual coal mine water at low pH in the presence of coal-derived activated carbon. Electrophoretic mobility studies on precipitates obtained by both lime and limestone neutralization of coal mine water yielded information which can be

pplied for more effective sludge removal. Magetic sludges were prepared using two different on-bearing waters. The conversion of precipitates o a magnetic form results in significant reductions n settled sludge volumes as well as increases in olids content, compared to the initially formed ludge obtained by lime neutralization alone. Data btained in these studies indicate that the mestone process offers considerable promise for n improved lower cost method for treating several ypes of coal mine waters.
W70-08167

NDUSTRIAL WATER RECIRCULATION IN NORTHEASTERN ILLINOIS,
llinois State Water Survey, Naperville.
For primary bibliographic entry see Field 03E.
W70-08228

A WATER/WASTE WATER GUIDE TO EUROPE, PART I: TREATMENT PRACTICES,
Detroit Metropolitan Water Services, Mich.
Michael J. Taras.
Water and Sewage Works, Vol 116, No 1, January 1969. p 10-15.

Descriptors: *Water treatment, *Water purification, *Waste water treatment, *Ozone, Chlorination.
Identifiers: *Ozonation, Europe.

This is the result of an eight-week survey of northern European water and waste water treatment practices. Subjects covered include an overview of European practice: ozonation, chlorination, flouridation, Russian treatment practice, Dutch treatment, practice, and the Rye Meads tertiary treatment plant. Treatment practices in Europe include combinations of impoundment reservoirs, percolation through sand dunes, microstraining, chlorination, ozonation, coagulation with chemicals, activated carbon adsorption, sedimentation, and rapid and/or slow sand filtration. European water is harder than American water, and Europeans often complain they see too many water softening installations in their tours of the U.S. Ozonation is gaining popularity in Europe, both from a standpoint of decreased cost of chemicals and avoidance of formation of chlorophenols. Chlorination and chloramination remain the dominant disinfectants of European water supplies. Russian treatment practices resemble U.S. practices. In addition to the rapid sand filter, the Russians use the new AKAHA filter which embodies and collection pipe system in the middle of the sand bed, enabling water to be filtered by gravity through the upper portion of the bed, and by upflow through the lower portion of the bed. (Makela-Texas)
W70-08293

A WATER/WASTE WATER GUIDE TO EUROPE: PART 2: ANALYTICAL METHODS,
Detroit Metropolitan Water Services, Mich.
Michael J. Taras.
Water and Sewage Works, Vol 116, No 2, February 1969, p 50-55. 1 tab.

Descriptors: *Water treatment, *Water purification, *Waste water treatment, *Water pollution, *Analysis, *Analytical techniques, *River basin commissions, Standards.

Three books of analytical methods of examining water/waste water are found in widespread use in Europe. One is compiled by each nation with the aim of standardizing results among the laboratories of that nation. The other two books are the latest editions of the World Health Organization International Standards for Drinking Water and the American Standard Methods for the Examination of Water and Waste water. Coliform counts are obtained by multiple tube lactose broth fermentation and membrane filter. The London Metropolitan Water Board has developed a synthetic glutamic acid medium which achieves better results than the conventional lactose broth. European analytical trends tend to parallel those of the U.S. Virtually all European laboratories possess a filter photometer and an ultraviolet-visible range spectrophotometer. Infrared and atomic adsorption spectrophotometers are gaining in popularity. A new apparatus named the Vorth Sapromat has received much consideration for its applicability in the analysis of biological treatment of waste water. The tendency in Europe is toward regional pollution control agencies, usually based on a whole river basin. These agencies, like the Emscher Association, regulate drainage conditions and waste water treatment in the river basin. Membership in the authority is mandatory, and financing is guaranteed by assessments on the members in proportion to the volume and noxiousness of their waste discharges. (Makela-Texas)
W70-08294

BUTTERFLY VALVES INSTALLED WITHOUT INTERRUPTION IN WATER SERVICE,
Pratt (Henry) Co., Aurora, Ill.
Bruce F. Ranney.
Water and Sewage Works, Vol 116, No 9, p 354-355, September 1969. 4 fig.

Descriptors: *Water distribution, *Valves, *Pressure conduits, Installation.
Identifiers: *Butterfly valve, *Line plug, Aurora, Illinois.

The main pumping station in the water distribution system of Aurora, Illinois, was successfully isolated so that repairs and maintenance work could be performed without interruption in service. The project consisted of the installation of two butterfly valves while the 16 inch distribution lines were under pressure. Advance valve installations performed the project by installing 2 plugs into the 16 inch mains with their special equipment. These plugs restrained the city water pressure while the butterfly valves were being installed. The valves were installed in less than two days. Similar installations can be made at sewage treatment plants where the same general type of valve difficulty occurs. (Galwardi-Texas)
W70-08295

INVESTIGATION AND REPAIR OF EXISTING SEWERS,
Underwater Tel-Eye Ltd. (Canada).
K. F. Perkins.
Water and Pollution Control, Vol 107, No 11, November 1969, p 32-33.

Descriptors: *Sewers, *Investigations, *Photography, Repairing, Pipes.
Identifiers: *Television cameras.

The technology of detection of sewer problems has been advanced by the introduction into the technology of photographic and television equipment. Cameras available include both two dimensional and three dimensional still photo cameras and battery operated motion picture cameras. Disadvantages of photographic equipment are the limited film load with its accompanying large interval between pictures, and inability to detect equipment malfunction or line blockage until the film is developed or the camera becomes stuck. The use of closed-circuit television avoids both these problems. It allows instantaneous viewing, with the capabilities of stopping the camera for study of a given area. Photographs can be taken from the surface monitor for future reference. TV cameras also show more detail than the naked eye can pick up. The camera can be repositioned to study the same area from different positions. Photographic systems should be more costly to operate than television systems due to reshooting costs, extensive picture review time, and film developing costs. In addition to use for inspection of existing sewer lines for problems, the television system can be used to inspect new lines prior to acceptance by the municipality. Even the contractor can use this service. (Makela-Texas)
W70-08296

FEDERAL GRANTS FOR MUNICIPAL WASTE TREATMENT--THE NEED FOR POLICY CHANGE,
Municipality of Metropolitan Seattle, Wash.
James R. Ellis.
Journal of the Water Pollution Control Federation, Vol 42, No 5, Part 1, p 679-684, May 1970. 1 tab, 2 ref.

Descriptors: *Grants, *Sewage treatment, *Legislation, Governments, Costs, Federal Government, Waste water treatment, Sewage, Construction.
Identifiers: *Incentives, Bonds, Growth.

The biggest problems are in big cities; however, the large metropolitan areas have been neglected sadly by the federal government and it is time to shift the balance. This can be done by adopting six changes in our federal policy. (1) Redress the large city inequity by authorizing incentive grants for qualifying new projects. (2) Make combined sewer overflow abatement facilities eligible for federal grants. (3) Make the federal grant commitment reliable as to receipt and adequate as to dollars. (4) Strengthen the market for local bonds by renouncing the abortive effort to tax municipal bonds by redressing the supply-demand equation by substantial federal support. (5) Develop regulatory standards which encourage local communities to direct their worst local problems and which will get the most pollution abatement for each federal and local tax dollar. (6) Encourage the local use of sewer service charges by offering a federal grant incentive, but do not permit any industry to destroy any stream for a fee. (Hancuff-Texas)
W70-08297

OXNARD SEWAGE PLANT SOLVES ODOR CONTROL PROBLEM,
Oxnard, Calif.
Stanley G. Pateman.
Water and Sewage Works, Vol 116, No 10, p 352-353, October 1969. 3 fig.

Descriptors: *Waste water treatment, *Odor, *Control systems, *Costs, *Industrial wastes, California.
Identifiers: *Farm produce wastes, *Malabate reodorants, Oxnard (California).

The Oxnard waste treatment plant has solved an extremely difficult odor control problem which resulted from the treatment of farm produce processing wastes. The system consists of fog spray nozzles which distribute a series of Malabate reodorants. The Malabates chemically treat the odors, not just mask them without raising the odor level. The Malabate reodorants do not corrode nozzles or pumps. Total installation cost of the complete system was less than $3,200 and chemical costs average less than $3.50 per day. The system is used only 6 to 8 hours per day. (Galwardi-Texas)
W70-08298

ARE PAVED DRYING BEDS EFFECTIVE FOR DEWATERING DIGESTED SLUDGE.
Virginia Polytechnic Inst., Blacksburg.
Clifford W. Randall.
Water and Sewage Works, Vol 116, No 10, p 373-376, October 1969. 6 fig, 1 tab, 7 ref.

Descriptors: *Sludge, *Sludge treatment, *Sewage sludge, *Dewatering, *Dry beds.
Identifiers: *Digested sludge.

The usefulness of paved sludge beds of center drain design for dewatering aerobically digested activated sludge is evaluated to determine if they provide a more economical solution than conventional sand beds. Paved bed design permits use of mechanical equipment for cleaning and thereby reduces the cost of labor and sand replacement. Anaerobically digested sludges dewater readily on partially obstructed paved beds due to the lateral drainage of water to the unobstructed portion of the bed. In this study, four beds were prepared, two of which were paved except for the center drain,

and two of which were conventional sand beds. Activated sludge from a municipal treatment plant was dried in 8 and 4-inch layers on the two types of beds. Sludge on the sand beds dewatered to less than 15% moisture content within 7-9 days for the 4 to 8-inch sludge layers, respectively. The sludges on the paved beds drained very slowly and after 10 days were still saturated. The author concludes that paved beds of center drain design are not desirable for dewatering aerobically digested sludge. Lateral drainage is poor and does not significantly contribute to the dewatering process. The poor drainage was not due to air binding of the sand drain, but to the nature of the sludge itself. (Makela-Texas)
W70-08300

TYPES OF ACTIVATED SLUDGE WHICH SEPARATE POORLY,
Northwestern Univ., Evanston, Ill.
Wesley O. Pipes.
Journal of the Water Pollution Control Federation, Vol 41, No 5, p 714-724, May 1969. 7 fig, 18 ref.

Descriptors: *Activated sludge, *Settling basin, *Sludge, *Settling velocity, *Aeration, Biochemical oxygen demand, Microorganisms, Growth stages, Performance, Sewage treatment, Waste water treatment.
Identifiers: *Bulking, Characteristics, *Sludge volume index.

Practically all problems of the activated sludge process are manifest by poor separation of sludge in the secondary sedimentation tank and an increase in effluent BOD because of respiratory oxygen consumption by sludge or organisms in the effluent. Loss of sludge organisms in the effluent may be caused by any or all of three things. (1) Poor design of the secondary sedimentation tank which results in the loss of septic sludge or billowing sludge in the effluent. (2) Rising sludges produced by biological phenomenon when overaerated sludge is produced by mechanical phenomenon. Both of these phenomenon are understood well and can be eliminated by corrections in the operation of the aeration tank. (3) The formation of a type of sludge which settles poorly. Dispersed growth, while not actually a form of activated sludge may form in an activated sludge process. Continuous formation of the dispersed growth indicates the entire waste treatment system was conceived poorly and should be redesigned completely. Bulking sludge, floating sludge, pinpoint floc, and deflocculated sludge are each complexes of several different types of sludge. Each needs further study before separation into component types and solution to specific problems is possible. Given adequate capacity in secondary sedimentation tank and return sludge pumps an activated sludge process can be operated successfully with a bulking sludge to produce an excellent quality effluent. There is no known way to get a good quality effluent from an activated sludge process which is producing large quantities of floating sludge, pinpoint floc or deflocculated sludge. (Hancuff-Texas)
W70-08301

INFLUENCE OF TURBULENCE ON THE ACTIVITY OF ACTIVATED SLUDGE FLOCS,
Technische Hochscule, Karlsruhe (West Germany).
L. Hartmann, and G. Laubenberger.
Journal of the Water Pollution Control Federation, Vol 40, No 4, p 670-676, April 1968. 8 fig, 3 tab, 4 ref.

Descriptors: *Turbulence, *Oxygenation, *Reynolds number, *Activated sludge, Dissolved oxygen, Microorganisms, Temperature, Flocculation.
Identifiers: *Uptake rates, *Oxygen tension.

Experiments related to the influence of turbulence on the activity of activated sludge flocs reveal the following results: (1) At high concentrations of organic material in the mixed liquor the transport of oxygen from the environment to the cell surface is the rate limiting link in the chain of biodegradation reactions. An increase in the oxygen pressure in the environment also results in an increase in the oxygen consumption by the floc. (2) Turbulence has a double influence; (a) the breaking apart of the agglomerated flocs into the bacterial colonies which are the smallest units of the floc, and (b) the exchange of contact area between bacteria and environment. Both phenomenon result in an increase of oxygen uptake. (3) Deflocculation starts while the fluid is still in laminar movement and extends to some degree into turbulent conditions. At Reynolds Number of around 5000 no further influence of water movement on the physical properties of the floc seem to occur. The influence of turbulence on the exchange of the contact layer between bacteria and water occurs mainly between Reynolds Numbers of 5000 and 9000. (Hancuff-Texas)
W70-08302

UNIT PROCESS PERFORMANCE MODELING AND ECONOMICS FOR CANNERY WASTE TREATMENT,
Water Resources Engineers, Inc., Walnut Creek, Calif.; and San Jose State Coll., Calif.
Denny S. Parker, John R. Monser, and Robert G. Spicer.
Proceedings, Industrial Waste Conference, 23rd, May 1968, p 710-739. 10 fig, 14 tab, 18 ref.

Descriptors: *Canneries, *Cost analysis, *Design criteria, *Economic efficiency, *Economics, *Optimization, Design data, Economic feasibility, Efficiencies, Model studies, Performance, Waste treatment, Waste water treatment.
Identifiers: *Unit processes, Waste characteristics.

Data from several unit processes was analyzed with reference to one particular cannery waste for the development of optimal design criteria. Due to the nature of the data, the input requirements for the system design procedure were termed cost-size-efficiency (C-S-E) relationships. Twelve alternative unit processes are analyzed including: activated sludge, lagoons and chemical waste treatment systems. In the system optimization analyses, the C-S-E relationships were used to determine the minimum cost solution. Design data and costs for an 8 MGD activated sludge plants are presented for the least cost solution for each level of efficiency. At the lower efficiencies, aeration costs go down, but clarification costs rise. A linear regression model predicting BOD removal efficiency is presented for lagoons, although the use of lagoons is not recommended for cannery wastes due to the lack of nitrogen and the shock loading a lagoon receives when the canning season begins. Chemical precipitation combined with sedimentation allowed BOD removals to approach 50%. Chemical oxidation with potassium permanganate offers attractions in its simplicity of operation and ease of control. Economic considerations would be the main determinant in its selection. (Aguirre-Texas)
W70-08303

CHEMICAL CONDITIONING OF BIOLOGICAL SLUDGES FOR VACUUM FILTRATION,
Notre Dame Univ., Ind.
Mark W. Tenney, Wayne F. Echelberger, Jr., John J. Coffey, and Timothy J. McAloon.
Journal of the Water Pollution Control Federation, Vol 42, No 2, p RI-20, February 1970. 12 fig, 1 tab, 28 ref.

Descriptors: *Activated sludge, *Dewatering, *Flocculation, *Sewage treatment, *Sludge, *Vacuum drying, Filtration, Sludge treatment, Waste water treatment.
Identifiers: *Conditioning, *Polyelectrolytes, Chemical treatment, Flocculants, Flocculating, Sludge drying.

Polymeric flocculation produced biologically is a properly operating activated sludge process are not effective as sludge conditioners of waste sludge for dewatering by vacuum filtration. It is necessary y add chemical conditioners or synthetic organ polyelectrolytes to structure properly the waste a tivated sludge. Conditioner dosage was found to b affected by the carriage waste water quali parameters of pH, alkalinity, and phosphate co centration; and the sludge parameters of solids co centration, storage lime, and primary sludge m ratio. The optimum pH for effective conditioni of the sludges tested was in the range of 6.0 to 7 for iron (III) and 4.5 to 5.5 for aluminum (III). A increase in either alkalinity, phosphate concentr tion, solids concentration, storage time, and prim ry sludge mix ratio required an increase in cond tioner dosage necessary to enhance the dewaterin of waste activated sludge. (Aguirre-Texas)
W70-08304

TREATABILITY STUDIES OF INDUSTRIA WASTES EFFECTED THROUGH PROCES SIMULATION,
Prosearch Ltd., Oakville (Ontario).
Robert W. Baker, and Frank Guillaume.
Water and Sewage Works, Vol 116, No 9, p 32-3 September 1969. 15 fig, 1 ref.

Descriptors: *Simulation analysis, *Industri wastes, *Design criteria, *Waste water treatmen Lagoons, Biological treatment, Performance, Oi Poultry.
Identifiers: *Treatability studies, Unit operation Clarifier, Aerated Lagoons.

The importance of treatability studies effecte through process simulation of the unit operation involved in a waste water treatment plant i emphasized. Treatability studies can be used t predict the cost-effectiveness of different uni operations. Effects on a waste treatment plant fro new product development or changes in produc tion techniques can safely and accurately be pre dicted in the laboratory using simulatio techniques. Four case histories are presented. A clarifier performance comparison showed tha suspended solids removal would be a fraction o what would be anticipated from using the widel accepted design criteria. The percentage of tota carbon removed varied between 1.0 and 2.5 pe cent and was independent of the hydraulic loadin rate over the range investigated. Case No 2 in volved a petrochemical complex discharging waste into a conventional lagoon. Studies showed tha biological treatment was not an acceptable mean of treatment. Case No 3 involved a chicken packing house waste and results showed that a par tially mixed aerated lagoon would provide adequate treatment and that a completely mixed aerated lagoon would not be necessary. The last study relates to the frequent problem of a plant designed and built for a projected hydraulic and pollutional load which will not be attained fo several years. (Galwardi-Texas)
W70-08305

TRANSIENTS IN THE ACTIVATED SLUDGE PROCESS,
Sterling Drug, Inc., Rothschild, Wis. Zimpro Div.
Paul V. Knopp, Donald G. Watts, and Gerald A. Rohlich.
Proceedings Industrial Waste Conference, 23rd, May 1968, p 894-913. 10 fig, 1 tab, 23 ref.

Descriptors: *Activated sludge, *Dynamics, *Effects, *Frequency analysis, *Organic loads, Model studies, Mathematical models, Organic matter, Variability, Waste water treatment.
Identifiers: *Shock loads, *Transients, Concentration.

Aspects of modeling the dynamics of the completely mixed activated sludge process are discussed and estimates of the effects of variation in the concentration of organic material in the treatment plant effluent are presented. The usefulness of frequency response analysis of input-output records from the activated sludge process was demonstrated. COD was shown to be a poor indicator of system

esponse and can probably be attributed to the fact hat the COD measurement is far too gross a mea- urement to indicate the dynamic changes within he system. The activated sludge system can be escribed as a low frequency pass system. Further ork is required to determine the effect of varia- ion in flow, and finally, joint frequency response nalysis of systems for which both flow and concen- ration vary with time. Frequency response analysis f actual operating plants is recommended as a eans of explaining output variation and to assist n developing models for the control of the ac- ivated sludge process. (Aguirre-Texas)
W70-08306

ECONOMICS OF AERATION IN WASTE TREATMENT,
Eimco Corp., Salt Lake City, Utah.
A. A. Kalinske.
Proceedings Industrial Waste Conference, 23rd, May 1968, p 388-397. 3 fig, 6 ref.

Descriptors: *Activated sludge, *Aeration, *Economics, *Equipment, *Lagoons, *Waste treatment, Biological treatment, Waste water treatment.
Identifiers: Diffused aeration, Mechanical aeration, Surface aerators, Turbine aerators.

The economics are discussed of aeration for those aerobic processes where the organisms are kept in suspension in the liquid waste; primarily the activated sludge process and all its modifications, and so-called aerated lagoons. Three principal oxygenation methods presently in use are: diffusion of compressed air, diffused air with submerged turbine dispersers, and mechanical surface entrainment aerators. Diffused air systems will average about double the power consumption of well designed mechanical-type surface entrainment aerators. Installation costs also favor the mechanical surface-type aeration systems. High strength wastes can best be treated with activated sludge having the O2 supplied by mechanical means. Use of surface aerators in large lagoons can be the cheapest method for treatment of a wide variety of industrial wastes. The non-steady, clean water test technique is the most useful and practical for evaluating the O2 input efficiency of aeration equipment. The main factor that must be given careful attention is that the basic contents are properly mixed by the aerator. (Aguirre-Texas)
W70-08307

BIOLOGICAL TREATABILITY OF VARIOUS AIR FORCE INDUSTRIAL WASTES,
Kelly AFB, Tex.
James A. Mueller, and Walter W. Melvin, Jr.
Proceedings Industrial Wastes Conference, 23rd, May 1968, p 398-427. 20 fig, 8 tab, 4 ref.

Descriptors: *Biological treatment, *Industrial wastes, *Laboratory tests, *Toxicity, Biochemical oxygen demand, Biodegradation, Chemical oxygen demand, Military reservations, Oxygen demand.
Identifiers: *Air Force, *Treatability, Field studies.

Biodegradability studies on specific Air Force industrial wastes have indicated that many of these wastes can be treated in a biological treatment system. These studies gave the toxic levels of these wastes and degree of treatment to be expected in a domestic treatment plant. The wastes resulting from paint stripping of aircraft, fire fighting foam, and disinfecting operations were studied in the laboratory to determine biodegradability. Paint stripping waste at COD concentrations from 1000 to 3000 mg/l gave maximum removal rates. Above 3000 mg/l COD the waste became toxic to the organisms. The BOD5 value for the paint stripping waste was about 1/3 of the COD value, whereas the effluent was about 1/8 the COD value. The fire fighting foam waste was not toxic to activated sludge microorganisms at COD concentrations of 6,000 mg/l and to waste stabilization pond microorganisms at COD concentrations of 16,000 mg/l. BOD removal for the ponds containing foam wastes averaged 94%. Formaldehyde from the disinfecting operations waste was completely removed from solution in 3 hours, by activated sludge, when the initial concentration was less than 30 mg/l but was only partially removed at concentrations of 100 mg/l or above after 8 hours aeration. (Aguirre-Texas)
W70-08308

THE ROLE OF PARTICULATE SUBSTRATES IN BIOTIC DEGRADATION OF ORGANIC MATERIALS,
Missouri Univ., Columbia.
Darrell L. King, and Rameshwar D. Verma.
Proceedings Industrial Waste Conference, 23rd, May 1968, p 75-86. 1 fig, 5 tab, 16 ref. OWRR-A-007-MO.

Descriptors: *Biodegradation, *Organic matter, Biochemical oxygen demand, Growth rates, Laboratory tests, Metabolism.
Identifiers: *Particulate substrates, Bacterial activity, Biological oxidation, Media.

Much of what is known about the activity of microbiological communities in the degradation of organic materials is based on studies in which the organic substrate was glucose present in the dissolved phase. Most wastes contain a significant amount of particulate material which serves as an attachment site for the heterotrophic microbiota and in many cases this available surface exterts a marked effect on bacterial activity. The objectives of this study were to determine the effects of the physical state of organic media on the metabolism of a complete aerobic community of microorganisms and on the bacterial portion of that community. The interactions between particulate material and increasing concentrations of dissolved organic nutrients available to the biota also were considered. From this study it became apparent that the presence of particulate materials in organic waste streams plays a significant role in determining the type and extent of energy fixation and utilization by populations of heterotrophic microorganisms. When particulate surface was available for bacterial colonization the energy conversion efficiency was roughly 50% while in the dissolved media only about 14% of the energy released during biotic activity was channeled into new biomass. (Aguirre-Texas)
W70-08309

DISSOLVED - AIR ION FLOTATION OF INDUSTRIAL WASTES HEXAVALENT CHROMIUM,
Kentucky Univ., Lexington.
Robert B. Grieves, Gregory A. Ettelt, J. Thomas Schrodt, and Dibakar Bhattacharyya.
Proceedings Industrial Waste Conference, 23rd, May 1968, p 154-164. 5 fig, 2 tab, 10 ref.

Descriptors: *Chromium, *Efficiencies, *Foam separation, *Optimization, *Regression analysis, Industrial wastes, Pilot plants, Surfactants.
Identifiers: *Floatation, *Ion flotation.

Efficiency of a pilot-plant scale, dissolved air ion flotation unit for the removal and concentration of dichromate is evaluated. Data obtained are subjected to a multiple regression analysis involving polynomial expressions. Equations, accurately representing the data are generated which relate the fractional flotation (removal) of dichromate, the enrichment ratio for dichromate, and the fractional flotation of surfactant to the five independent variables that were considered. The optimum values of the independent variables were: a polymer dosage 3.2 or 4.8% of the feed concentration of dichromate, a molar feed ratio of surfactant to dichromate of 2.1, 170% recycle, a detention time of 85 minutes, and a feed concentration of dichromate of about 100 mg/l. Including a feasible process of surfactant recovery, the approximate chemical cost is about $0.67 per lb of chromium. The primary advantage of the dissolved-air, ion flotation is the concentration of the chromium in a liquid volume less than one per cent of the volume of the waste. (Aguirre-Texas)
W70-08310

AEROBIC THERMOPHILIC PROCESS FOR THE BIOLOGICAL TREATMENT OF WASTES--SIMULATION STUDIES,
Clemson Univ., S.C.
Kawi Kambhu, and John F. Andrews.
Journal of the Water Pollution Control Federation, Vol 41, No 5, p R127-141, May 1969. 12 fig, 2 tab, 18 ref.

Descriptors: *Biological treatment, *Mathematical models, *Waste water treatment, *Simulation, *Thermophilic bacteria, Aerobic treatment, Digestion, Disposal, Temperature.
Identifiers: Garbage.

A mathematical model is developed for a thermophilic process using material balances for sludge and garbage, based on a complete-mixing, continuous-flow reactor with the reaction rate constant being expressed as a function of temperature. Oxygen, energy, and heat balances are made. Sufficient heat can be obtained through thermogenesis to maintain thermophilic temperatures (45 deg to 65 deg) thus making the process autothermal. The results presented should be considered only semi-quantitative in nature since reliable values are not available for the effect of temperature on the rate constant. The simulations presented are for a mixture of primary plus waste activated sludge from a city of 10,000 population. Per capita contribution of total solids is assumed to be 0.2 lb/day of which 70% is volatile. Of the volatile solids, 70% is assumed to be biodegradable. Since low temperatures will be critical for the process, an outside air temperature of 2 deg C and an influent sludge temperature of 2 deg C are used. Oxygen requirements are assumed to be 1.4 lb of oxygen/lb of VS destroyed. Reactor temperatures over 100 deg F are attained at all residence times greater than 5 days. Too high an aeration rate can lower the reactor temperature and decrease the percentage of VS destroyed. Higher temperatures and increased VS destruction can be obtained by using thickening to increase the influent sludge solids concentration. (Aguirre-Texas)
W70-08311

ADVANCES MAKE WASTE WATER FILTRATION ECONOMICAL AND EFFECTIVE SOLUTION,
Graver Water Conditioning Co.
Robert Dvorin.
Industrial Wastes, Vol 116, No 9, p 12-16, Sept 1969. 5 fig, 6 ref.

Descriptors: *Waste water treatment, *Filtration, *Deep will pumping, *Municipal wastes, Tertiary treatment.
Identifiers: *Dual media, *Air scouring, *Bed depth, *Steel mill wastes.

Filtration technology progress has increased the applications of filters for waste water treatment flow rates have increased to 5-15 gpm/sq.ft with the use of dual media and increased bed depths. Also waste waters containing higher concentrations of suspended solids can be filtered. Air scouring is required along with conventional water backwash on filters operating on high concentrations of suspended solids. An underdrain system, Roto-Scour, discharges all the air and water within 1/4 inch of the filter bottom. Thus applications of filters operating on waste water are steel mill scale filters, municipal tertiary treatment filters and deep well disposal filters. Filters treating a steel mill scale waste having a suspended solids concentration of 100-150 mg/l can be operated at a flow rate of 15 gpm/sq ft. with a cycle time of 12-16 hour and produce an effluent normally containing less than 10 mg/l suspended solids. Tertiary filters can reduce suspended solids from 20-40 mg/l to less than 5 mg/l with a flow rate of 5-7 gpm/sq.ft. Wastes containing between 10-200 mg/l suspended

solids have been filtered before deep well disposal. (Aguirre-Texas)
W70-08312

EFFECTS OF LOADING ON A BIOLOGICAL TERTIARY TREATMENT SYSTEM,
Washington Univ., Seattle.
H. Kirk Willard, and D. A. Carlson.
Proceedings Industrial Waste Conference, 23rd, May 1968, p 740-753. 9 fig, 3 tab, 20 ref.

Descriptors: *Biological treatment, *Mathematical models, *Tertiary treatment, Activated sludge, Effects.
Identifiers: *Aufwuchs biocoenose, *Loadings, *Particulate removal, Suspended solids.

A new two-phase biological tertiary waste treatment system has been proposed. It includes an aerobic bacterial growth unit and a particulate removal unit. In a study of the second phase, the effects of SS loading on a community of attached particulate feeding organisms were determined. Bacterial substrate utilization and growth of the aufwuchs biocoenosis could be described as follows: F (S0-S1) = mu (S1) (A) (gamma)/ (Ks+S1)Y. The maximum growth rate constant mu was determined to be 0.026 and the half-rate constant Ks was 6.2 mg/l. A biomass yield of 16% of the influent SS for the particulate feeders produced a low effluent solids concentration of only 0.069 mgSS/mg BOD removed. Total dissolved organic carbon was over 90% destroyed in the bacterial and aufwuch's units. Similar removal values of 90 to 94% were measured for BOD. The decreases of both organic carbon and BOD were higher at lower loading rates. A method for the rapid removal of SS and carbonaceous materials can now be used based on a rational mathematical approach. (Aguirre-Texas)
W70-08313

EVALUATION OF THE KRAUS MODEL OF ACTIVATED SLUDGE BULKING,
Northwestern Univ., Evanston, Ill.
Wesley O. Pipes, and Frank S. Meade.
Proceedings Industrial Waste Conference, 23rd, May 1968, p 111-125. 5 fig, 7 tab, 8 ref.

Descriptors: *Activated sludge, *Evaluation, *Kinetics, *Mathematical models, *Sludge, Biochemical oxygen demand, Organic matter, Sludge treatment.
Identifiers: *Bulking, *Kraus Model, *Sludge volume index, Solids.

Most of the proposed kinetic models of the activated sludge process interpret effluent BOD as being caused by organic matter which was originally present in the influent waste, but not removed in the aeration tank. Sludge solids lost in the effluent from the secondary settling tank will cause a high effluent BOD which is not due to unchanged organic matter from the influent. Bulking sludge can lead to the loss of sludge solids in the effluent, the amount of which could be predicted from the sludge volume index in a formulation developed by Kraus. An evaluation of the Kraus model was made based on two hypotheses: (1) the sludge volume index of a sludge sample remains constant with respect to time if no new sludge particles are formed, and (2) the sludge volume index of a mixture of two different sludge samples is the weight fraction sum of the SVI of each sample. The SVI of most samples of normal sludge (SVI 100 ml/gm) will remain constant during aeration for a few days. The mixture of two different sludge samples is not necessarily the weight fraction sum of the SVI of each sample. (Aguirre-Texas)
W70-08314

INSTRUMENTATION FOR RESEARCH ON BIOLOGICAL PROCESSES,
Moore Products Co., Knoxville, Tenn.
Charles W. Crawford, Kawi Kambhu, and John F. Andrews.
Proceedings Industrial Waste Conference, 23rd, May 1968, p 1039-1053. 16 fig.

Descriptors: *Automatic control, *Biological treatment, *Data processing, *Instrumentation, *Research equipment, Control, Data collections, Data storage and retrieval, Digital computers, Measurement, Waste water treatment.
Identifiers: *Data acquisition system, Process variables.

Many of the limitations of previous studies on biological processes used for waste treatment have been due to the many variables involved, time requirements for bringing the microbial cultures to steady state, and a lack of control of some of the more important variables. Significant advances could be made in the solution of these problems by using appropriate instrumentation for automatic control and analysis of important variables and automatic collection and formating of data for direct entry into a digital computer by using a data acquisition system. Measurement and control of process variables includes: (1) Gas composition; (2) Gas flow rate; (3) Dissolved oxygen; (4) Temperature; and (5) pH. A beckman DEXTIR data system was used for the automatic collection and formating of data for direct entry into a digital computer. This is an expandable data acquisition complex which is designed to accept signals from various sensors located within several research laboratories and channel them to a centralized processing unit. The instrumentation and data acquisition systems described have only recently been placed in operation and the results of operating experience are therefore not available. (Aguirre-Texas)
W70-08315

PERFORMANCE OF INTERNALLY CLARIFIED ACTIVATED SLUDGE PROCESS TREATING COMBINED PETROCHEMICAL-MUNICIPAL WASTE,
Union Carbide Corp., South Charleston, West Va.
G. W. Kumke, R. A. Conway, and J. P. Creagh.
Proceedings Industrial Waste Conference, 23rd, May 1968, p 567-582. 13 fig, 5 tab, 7 ref.

Descriptors: *Activated sludge, *Efficiencies, *Industrial wastes, *Municipal wastes, *Organic loading, *Performance, Chemical wastes, Oil wastes, Waste treatment, Waste water treatment.
Identifiers: *Internally clarified, *Joint treatment, *Petrochemical wastes.

A four-year evaluation of the treatment of a combined petrochemical-municipal waste in full-scale aerator-clarifier units has been completed. The performance data for this type of activated-sludge process indicate that the removal capacity of BOD5 from the mainly petrochemical waste at an 80% efficiency reaches 180 lb/day/1000 cu ft. aeration volume. An average removal of 130 lb BOD5/day/1000 cu ft. was obtained. A concentration of 5000 mg/l of highly active biological solids could be maintained to accommodate wide variation in waste water strength and constituents. The effects of detention time, organic loading, and sludge age on performance were delineated. BOD removal varied from 73 to 93% over a range in retention times of 5.5 to 15 hours. A gradual decline in BOD5 removal from 86% to 80% was observed with a loading increase of from about 130 to 230 lbs BOD5/day/1000 cu ft. Little correlation existed between sludge loading and BOD5 removal in range of 0135 to 1.6 lb BOD5/day/lb MLSS. The aeration solids were maintained between 4000 and 6500 mg/l throughout the four-year operating period to provide a buffer to accommodate the variability of the industrial waste. (Aguirre-Texas)
W70-08316

WASTES FROM THE PRESERVATION OF WOOD,
Mississippi State Univ., State College.
E. Joe Middlebrooks, and Erman A. Pearson.
Proceedings Industrial Waste Conference, 23rd, May 1968, p 213-228. 8 fig, 2 tab, 5 ref.

Descriptors: *Biological treatment, *Chemical precipitation, *Creosote, *Preservation, *Toxicity, *Wastes, *Wood preservatives, Laboratory tes Oil phenols, Waste treatment.
Identifiers: Gulfport, Mississippi.

Little information is available dealing with t treatment of wood preservation wastes, and t results in this report should be useful as a guid designing waste treatment facilities for other wo preservation plants. The waste contains toxics but it is amenable to biological treatment. COD of the effluent from the biollogical proc ranged from 1600 to 2000 mg/l resulting i removal of about 50%. A significant reducti (70%) in the chemical and biochemical oxygen d mand was achieved by flocculating the waste w lime (CaO). Chlorination alone did not effectiv reduce the COD of the waste. Chemical floccu tion followed by chlorination reduced the COD the waste by 85% and reduced the phenol conc tration to less than 0.5 mg/l. (Aguirre-Texas)
W70-08317

SEWERAGE PLANNING IN GREATT STOCKHOLM AREA,
Stockholm City Municipal Services De (Sweden).
Anders Cronstrom.
Water and Sewage Works, Vol 116, No 9, p 33 358, Sept 1969. 3 fig.

Descriptors: *Waste water treatment, *Sewa treatment, *Sewage disposal, *Sewera *Nutrients, *Regional analysis, Treatment fac ties, Biochemical oxygen demand (BOD Planning.
Identifiers: Stockholm (Sweden), Tunnel system

Intensive population redistribution within and the Greater-Stockholm area is expected by the ye 2000; consequently large and difficult sewera problems will be created. Population in the area expected to increase through urbanization from t present 1.5 million people to 2 to 2.5 million. Alt native regional plans for biological sewerage tre ment are presented with an objective of constru ing treatment plants which would provide at a weather inflow and normal operating conditions efficiency of 95% removal of BOD. One alternati calls for construction of a tunnel system to conv all sewerage to a treatment plant which wou sewer the entire area and have an ocean discharg The other alternative considers using existi plants along with new regional treatment plants a a tunnel system which would only serve as an outl conduit to better receiving waters. The problem nutrient removal is being investigated. (Galwar Texas)
W70-08318

BACTERICIDAL EFFECTS OF ALGAE ON EN TERIC ORGANISMS,
Texas Univ., Austin. Center for Research in Wat Resources.
Ernst Davis, and Earnest Gloyna.
FWPCA Grant 18050 DOL. Technical Repo EHE-70-06, CRWR-55, 132 p, Mar 1970. 9 fi 144 tab, 60 ref.

Descriptors: *Algae, *Cultures, *Enteric bacteri *Oxidation lagoons, *Pathogenic bacteria.
Identifiers: *Autogomistic effects, *Axemic cu tures, *Dieoff rates, Aftergrowth, Blue-green alga Field studies, Green algae, Laboratory studies.

A series of experiments involving the effects blue-green and green algae on the dieoff rates selected bacteria were conducted. Axemic culture of Anabaena cylindrica, A. nidulans, Oscillatori chalybia, Chlorella pyrenoidosa and Scenedesmu obluguus among others. Cultures of enteric ba teria species (Adcaligeues faecalis, Enterobacte aerogenes, E. coli, Proteus vulgaris, Psudomona aerarginosa, and Serratia marcercens) were adde to the oxenic algal cultures during different period of the algal life cycles. Filtrate from actively gro ing algae was exposed to cultures of enterics determine whether any antibiotic compounds we

parted to the medium during lag phase growth of gae. To determine aftergrowth of the enteric spe-es, the duration of the tests was extended to about days. Mixed cultures of green and blue-green gae were exposed to both single species of enteric cteria and mixed cultures. Mixed algal cultures use a greater dieoff among the enteric bacteria an do individual species of algae. The dieoff aracteristics of pathogenic species, namely Sal-onella typhosa, S. paratyplin, Shigella dysen-iae, S. paradysentesiae, and Vibrio comma were so determined. The pathogenic species did not rvive as long as the enteric test species under nilar test conditions. Virtually no aftergrowth as detected on the part of the pathogenes. Aguirre-Texas)
70-08319

STIMATION OF SLUDGE CENTRIFUGE PER-ORMANCE,
orsk Institutt for Vannforskning, Oslo.
Aarne Vesilind.
Journal, Sanitary Engineering Division, roceedings, American Society of Civil Engineers, ol 96, No SA3, p 805-818, June 1970. 11 fig, 1 ab, 6 ref.

escriptors: *Sludge, *Centrifugation, *Dewater-g, Performance, Waste water treatment, Sewage eatment, Mathematical model, Sludge disposal.
dentifiers: *Variables, Laboratory scale.

laboratory test is developed which yields quan-tative information on the expected performance f centrifuges in dewatering of any particular udge. The laboratory tests were conducted at arious treatment plants around Scandanavia and he results correlated with prototype centrifuge erformance. Only the bowl or decanter type cen-rifuges were tested as these are by far the most ommon machines used for sludge dewatering. Materials other than sludge were not considered nd therefore, it can not be assumed that the tests ill be equally applicable to other materials. The ariables effecting centrifuge performance are di-ided into two types of parameters--machine varia-les and process variables. The most important arameters are listed. The machine variables in-lude centrifugal force, pool depth, and scroll rota-ional speed. The process variables are residence ime and sludge characteristics. A model to escribe centrifugal dewatering accurately must in-clude some measure of the two processes necessary or successful operation, settling, and scrolling. The ettling characteristics are determined through entrifugation of four 10-ml samples. Scrolling haracteristics are determined through a sludge enetrometer used to measure the sludge penetra-ion. A light fluffly sludge has a poor consistency nd can not be scrolled and therefore results in a ow reading. The numerical differences between redicted and actual performance can be expected o be within plus or minus 10%. (Hancuff-Texas)
W70-08320

VARIABILITY OF WASTE TREATMENT PER-FORMANCE,
Manhattan Coll., Bronx, N.Y.
Robert V. Thomann.
Journal, Sanitary Engineering Division, Proceedings, American Society of Civil Engineers, Vol 96, No SA3, p 819-837, June 1970. 15 fig, 3 tab, 6 ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Performance, *Variability, *Statistics, Mathematical model, Data, Analysis.
Identifiers: Theory, Primary treatment, Secondary treatment.

Several statistical techniques are applied to time variations of waste treatment processes restricted to municipal plants. The purposes of a time series analysis of municipal waste treatment plant data are (1) gain further insight into the nature of the variability of flow and biochemical oxygen demand, (2) to develop additional measures of performance of treatment plants which may prove useful in estimating future variabilities, and (3) to relate the behavior of the treatment plant to resulting stream quality variation. The results indicate a high degree of variability in secondary effluent BOD as measured by the coefficient of variation. Values range from 0.2 to 1.1. The distribution of this variance over frequency show a strong seasonal dependence for plants subjected to seasonal canning load, 5 day on and 2 day off oscillations were also noted in a power spectrum of several plants. For one plant the amplitude of this weekly oscillation is about 20% of the mean load. The results of the time series analyses also indicate the effect that load variability can have on the water quality of a stream. In the final analysis, this is the primary reason for being concerned with plant variations. Dissolved oxygen variations of 1.0 mg/l or greater appear to be possible from a mathematical model of the stream and the observed treatment plant spectrum. The theory indicates that the maximum DO variability will occur at the location of the critical DO deficit. (Hancuff-Texas)
W70-08321

EFFECT OF OXYGEN TENSION ON O2 UPTAKE AND SLUDGE YIELD IN COMPLETELY MIXED HETEROGENEOUS POPULATIONS,
Merck Sharp and Dohme Research Labs., Rahway, N.J.; and Oklahoma State Univ., Stillwater.
M. David Rickard, and A. F. Gaudy.
Proceedings, Industrial Wastes Conference, 23rd, May 1968, p 883-893. 6 fig, 23 ref.

Descriptors: *Mixing, *Oxygen requirements, Activated sludge, Biological treatment, Waste water treatment.
Identifiers: *Completely mixed system, *Oxygen tension, *Oxygen uptake, *Sludge yield.

Operation of a completely mixed steady-state reactor at constant agitation (velocity gradient) but varying oxygen tension has shown that oxygen uptake rate and biological solids yield remained relatively constant for the range of DO concentrations between 1.4 and 7.1 mg/l. In addition, no effect was noted on the amount of RNA or protein contained in the cells. Also, as oxygen concentration was increased, there was a slight increase in DNA content of the cells, and a small improvement in both COD and glucose removal efficiency. There was a significant decrease in carbohydrate content of the cells. Concerning oxygen uptake rate, it may be concluded, based upon the present results and the work previously reported, that agitation of the system exerts an effect independent of oxygen tension at values above those accepted for critical DO concentration. (Aguirre-Texas)
W70-08322

INTERRELATIONS BETWEEN BIOLOGICAL AND CHEMICAL CHARACTERISTICS IN ANAEROBIC DIGESTION,
National Inst. for Water Research, Pretoria (South Africa).
P. G. Thiel, D. F. Toerien, W. H. J. Hattingh, J. P. Kotze, and M. L. Siebert.
Water Research, Vol 2, No 4, p 393-408, Apr 1968. 2 fig, 9 tab, 19 ref.

Descriptors: *Anaerobic digestion, *Ecosystems, *Correlation analysis, Laboratory tests, Chemical oxygen demand, Nitrogen, Enzymes, Failures.
Identifiers: *Characteristics, *Linear correlation coefficients, *Volatile acid concentration, Bacterial counts, Gas productions.

The ecosystem of anaerobic digestion including determinations of both biotic and environmental characteristics and the interrelations between these characteristics was investigated. Three 14-liter laboratory-scale digesters were fed a synthetic substrate which contained limiting amounts of nitrogen, COD:N ratio of 135:1. The characteristics of these three digesters were followed daily until failure of digestion occurred as a result of the nitrogen deficiency. A significant increase in volatile acid concentration was taken as digester failure. Digester failure was noted after 12, 17 and 22 days. The daily observations included gas production data, chemical quality determinations, bacterial counts, and the determination of a wide range of intermediary metabolic enzymes. Linear correlation coefficients were determined between all the different characteristics observed. Significant correlations were found between many of the different characteristics. The changes taking place in the characteristics until failure occurred and the implications of some of the correlations found are discussed. (Galwardi-Texas)
W70-08323

ANALYTIC AND PROCESS CLASSIFICATION OF EFFLUENTS,
Connecticut Univ., Storrs.
T. Helfgott, J. V. Hunter, and D. Rickert.
Journal, Sanitary Engineering Division, Proceedings, American Society of Civil Engineers, Vol 96, No SA3, p 779-803, June 1970. 11 fig, 13 tab, 40 ref.

Descriptors: *Waste water treatment, *Classification, *Effluents, Nutrients, Sewage treatment, Activated sludge, Membranes, Adsorption, Activated carbon, Organic chemicals, Electrodialysis, Membrane processes, Amino acids, Filtration, Turbidity.
Identifiers: Fractionation.

A choice of processes and systems to remove specific contaminants from waste water can better be made if chemical constituents and physical interactions of waste waters are better known. The work is directed towards the achievement of higher quality effluents through advanced waste treatment. The results of three separate studies are presented. (1) Analytical description and process classification information on primary, secondary, and advanced waste treatment plant effluents is presented. Data representing the average of 22 different treatment plants are presented with respect to the percentage breakdown of total COD as represented by various organic material. A fairly extensive literature review is presented in regard to organic constituents of sewage. (2) Comparison is made between adsorptivity of soluble organics from sewage and a secondary effluents. Certain organic materials present in effluents are not removed by absorption. On the basis of Total Organic Carbon analyses using dosages of activated carbon, residual organics in effluents are found to range from 2 mg/l to 8 mg/l TOC. (3) A classification technique, gravitational electrodialysis (GED) is presented. The GED method is used to further classify the residual organics of activated carbon treated effluents. Data have been collected to show that the residual organics from high activated carbon dosed effluents contain relatively more soluble cationic material than effluents of secondary and primary treatment. These residual organics of activated carbon treatment appear to be electropositive (cationic) and of high isoelectric value as determined by gravitational electrodialysis fractionation. The sizes are roughly between 10A deg and 100A deg (pL 9-8) and 0.1 (pL6): pL being defined as the negative log of the particle in meters. It is hypothesized that this residual class of organics contain nitrogenous groups that are the degradation products of bacterial cell walls.
W70-08324

DESIGN OF U-TUBE AERATION SYSTEMS,
New Mexico State Univ., Las Cruces.
Richard E. Speece, and Rudolph Orosco.
Journal, Sanitary Engineering Division, Proceedings American Society of Civil Engineers, Vol 96, No SA3, p 715-725, June 1970. 4 fig, 2 tab, 7 ref

Descriptors: *Aeration, *Design, *Mathematical model, *Oxygenation, Activated sludge, Bubbles, Regretion analysis, Headloss, Sewage treatment, Waste water treatment, Costs.
Identifiers: *U-Tube aeration, Efficiency.

Four independent parameters were studied in the design of U-Tube aeration systems. (1) air-water ratios, (2) inlet dissolved oxygen concentration, (3) depth, and (4) water velocity. Each different combination of parameters will result in different capital and operating costs. Outlet dissolved oxygen concentration is reported in this study for the following ranges of independent parameters. (1) air-water ratio-5 to 25%, (2) inlet dissolved oxygen-0 to 100% saturation, (3) depth-20 to 40 feet, and (4) water velocity-3.6 to 9.2 feet per second. The computer model of the gas transfer equation adapted to U-Tube aerator was used to evaluate the reaeration coefficient k2. Transfer of gases other than oxygen is analyzed. (Hancuff-Texas)
W70-08326

WATER QUALITY: COSTS BENEFITS OF IRREDUCIBLES,
Stone (Ralph) and Co., Inc., Los Angeles, Calif.
Ralph Stone, William Garber, and Helen Friedland.
Journal, Sanitary Engineering Division, Proceedings American Society of Civil Engineers, Vol 96, No SA3, p 691-697, June 1970. 1 fig, 4 tab, 2 ref.

Descriptors: *Costs benefit analysis, *Water resources, *Water quality, Economics, Surveys, Research and development, Statistics, Social aspects, Sewage treatment, Value engineering, Decision making.
Identifiers: *Questionnaire, *Advanced waste treatment, Algorithm.

The ASCE Committee on Sewerage and Sewage Treatment Design designed a questionnaire for distribution to Sanitary Engineering Division membership. The purpose of the questionnaire was twofold: (1) to determine the memberships attitudes and opinions concerning the existing and future social and economic value of alternative beneficial uses of the nation's water resources, and a few general questions relating response to immediate operational experience; (2) to demonstrate an algorithmic technique for quantifying nondeterministic or probabilistic data. Approximately 350 division members (20%) responded. They gave value judgement ratings (range from 1 to 10) for social and economic benefits. The analysis of questionnaires was based on both an algorithmic mathematical formulation and the Delphi method developed by the Rand Corporation. Both concepts were tested and found to support three basic premises: (1) the opinions of a large sample of informed persons have significant value, (2) qualitative judgments can be quantified by use of an abstract scale of relative values, and (3) averaging ranking and normalizing the resulting data provides tools for further information analysis. The study indicated that it is possible to quantify to a degree qualitative information, that sanitary engineers are aware of important social values, and that although existing research and development work is making a significant contribution this technological level can be greatly improved. (Hancuff-Texas)
W70-08328

FILTRATION OF CHLORELLA THROUGH DUNE-SAND,
Technion-Israel Inst. of Tech., Haifa (Israel).
Yair Folkman, and Alberto M. Wachs.
Journal, Sanitary Engineering Division, Proceedings American Society of Civil Engineers, Vol 96, No SA3, p 675-690, June 1970. 15 fig, 2 tab, 18 ref.

Descriptors: *Filtration, *Mathematical model, *Chlorella, Groundwater, Headloss, Stabilization, Ponds, Performance, Sewage treatment, Salinity, Effluents, Reclamation.
Identifiers: Concentration Efficiency.

To study processes occurring when effluents of stabilization ponds are used in artificial groundwater recharge, algae concentration experiments were conducted using a long column filled with dune-sand. A unicellular algae, chlorella, was used varying in size from 3 mu to 5 mu. Under conditions of darkness such as those prevailing in the experimental setup, Chlorella cells divide into smaller dark cells and their size distribution range becomes narrower; consequently, the efficiency of filtration is decreased. For all filtration velocities ranging from 1 to 6 meters per day, the retention of algae occurred mostly in the upper part of the sand column where the increments of headlosses were observed. The hydraulic gradient remained practically constant in the rest of the column. Changes of the relative concentration of algae as a function of depth closely corresponded with the filtration equation proposed by Ives (Proceedings Institution of Civil Engineering 16: 189-193, June 1960), when a coefficient 'b' was introduced to account for algae multiplication. The effect of cation concentration in water on the efficiency of filtration was clearly shown. The addition of cations to filtration water produced significant increases in that efficiency. When lower velocities were used, larger quantities of water could be filtered and the filtration efficiency would be higher. (Hancuff-Texas)
W70-08329

UNIFIED BASIS FOR BIOLOGICAL TREATMENT DESIGN AND OPERATION,
Stanford Univ., Calif.
Alonzo W. Lawrence, and Perry L. McCarty.
Journal, Sanitary Engineering Division, Proceedings American Society of Civil Engineers, Vol 96, No SA3, p 757-778, June 1970. 4 fig, 6 tab, 48 ref.

Descriptors: *Kinetics, *Biological treatment, *Activated sludge, *Anaerobic digestion, *Mathematical models, Growth, Design, Operations, Chemical oxygen demand, Biological oxygen demand, Nitrification, Digestion.

Biological solids retention time (SRT) is related to the performance of continuous biological processes employing suspensions of microorganisms in a fundamental way; therefore, SRT is suggested herein for use as an independent parameter in biological treatment process design and control. Steady-state kinetic models are presented for three process configurations, i.e., completely mixed reactor without solids recycle, completely mixed reactor with solids recycle, and plug flow reactor with solids recycle. Reported values of kinetic coefficients are tabulated for aerobic treatment of organic wastes, for aerobic treatment with nitrification, and for anaerobic treatment of organic wastes. The minimum solids retention time of models are compared with those for actual treatment systems and found to correlate quite well. (Hancuff-Texas)
W70-08330

ENUMERATION, ISOLATION AND IDENTIFICATION OF SULPHATE-REDUCING BACTERIA AN ANAEROBIC DIGESTION,
National Inst. for Water Research, Pretoria (South Africa); and National Inst. for Road Research, Pretoria (South Africa).
D. F. Toerien, P. G. Thiel, and Maria M. Hattingh.
Water Research, Vol 2, No 5, p 505-513, May 1968. 1 fig, 7 tab, 24 ref.

Descriptors: *Anaerobic digestion, *Anaerobic bacteria, *Isolation, *Sulfur bacteria, Sewage sludge, Sewage treatment.
Identifiers: *Desulfovibrio desulfuricans, *Enumeration, Sulphate-reducing bacteria, Ray.

Sulphate-reducing bacteria present in the anaerobic digestion of raw sewage sludge were isolated and enumerated utilizing a method in which anaerobiosis was achieved by the use of media with a low redox potential in stoppered bottles containing oxygen-free gas atmospheres. Carbon dioxide-bicarbonate buffer systems were employed in the media. Seven pure cultures of sulphate-reducing bacteria of the species Desulfovibrio desulfuricans were isolated from digesters being fed raw sewage sludge. No evidence for the presence of sulphate-reducing bacteria of the genus Desulfotomaculum was found. Sulphate-reducing bacteria occurred in numbers of 3-5 x 10 to the 4th power/ml in a a sewage sludge digester. This low count indic that these bacteria are not usually a major grou anaerobic digestion. Sulfate-rich water was ad to the media and the counts increased to .7-95 10 to the 6th power/ml. (Galwardi-Texas)
W70-08332

CURRENT TRENDS IN FARM WAS DISPOSAL,
Ministry of Agriculture, Fisheries and Food, L don (England).
C. T. Riley.
Water Pollution Control, Vol 69, No 2, p 174-1 February 1970. 3 tab.

Descriptors: *Animal wastes, *Farm wastes, Ca Hogs, Poultry, Odor.
Identifiers: *Manure, *Population equivalents.

Much emphasis has been placed on farm wa disposal in the past five years. Reasons for this clude the increased size of livestock units, near of units to consumers, recent legislation on ri pollution control and water resources, and react from the public and farm workers to flies and o associated with animal wastes. In 1967, the to volume of excreta produced by livestock in United Kingdom was 121 million tons, with a po lation equivalent of 136 million. Much of excreta is spread on the land by ranging anim The remainder must undergo some form of disp by man. The wastes can be handled in any of fo basic methods. (1) as a solid, it is stored and spr on land once or twice a year. (2) as a semi-solid is spread daily. (3) as a slurry, it is handled vacuum tanker, stored, and spread. (4) as a liqu it is washed by water to a storage tank and spr by spray irrigation. The trend is toward solid semi-solid handling. Factors affecting disp method include land availability, land area, vol of excreta, soil type, crops to be grown, and matic conditions, especially rainfall. More emph sis is now placed on planning of waste disposal fore starting farm projects. Odors can eliminated by aeration of wastes in the tanker fore spreading or spraying on the land. (Mak Texas)
W70-08333

TREATMENT, USE, AND DISPOSAL WASTES FROM MODERN AGRICULTURE,
Water Pollution Research Lab., Stevenage (E gland).
A. B. Wheatland, and B. J. Borne.
Water Pollution Control, Vol 69, No 2, p 195-2 February 1970. 12 tab, 21 ref.

Descriptors: *Farm wastes, *Animal wast *Wastes disposal, *Waste treatment, *Waste wa disposal, *Waste water treatment, *Biologic treatment, *Sludge disposal, *Sludge treatme Odor, Aerobic treatment, Incineration, Filtratio Hogs, Cattle, Poultry.
Identifiers: *Manures, *Vegetable washings.

With the trend toward larger concentrations more animals on smaller areas of land nearer pop lation centers, and the trend of the food industry require washing and packing of vegetables on t farm, the farmer is faced with new problems waste and waste water treatment and disposa Values for quantity of excreta, solids, BOD, CO PV, organic carbon, and total nitrogen are giv for cattle, hogs, sheep, poultry, and man. Rece experimental work on animal waste treatment a disposal is discussed. The problem investigated w odor control during storage and spreading of pi gery slurry by means of aeration. Problems whi occurred included foaming and bulking of the slu ry. The treated supernatant was to be recycled f use in washing the animal pens. Possible futu methods of treating animal wastes include incine tion, wet oxidation, and disposal at sea. Seve analyses of vegetable washing waste waters a presented, giving volumes, pH, solids, BOD, CO PV. Due to the variable nature of the processes i

ed in vegetable preparation, the actual degree ontamination of the waste water cannot be pre- ed accurately. Treatment includes minimizing quantity of waste water to be treated, and pri- y, biological and sludge treatment and disposal. nary treatment includes screening and sedimen- on. Biological treatment can be by lagoons, ated lagoons, oxidation ditches, extended aera- , conventional activated sludge, contact sta- ation, spray irrigation, biological filtration, or rate filtration. Sludges can be conditioned, de- ered and disposed at sea or on land. (Makela- as)
0-08334

E INFLUENCE OF METAL ION CONCEN- ATIONS AND PH VALUE ON THE GROWTH A NITROSOMONAS STRAIN ISOLATED OM ACTIVATED SLUDGE,
ter Pollution Research Lab., Stevenage (En- nd).
. Loveless, and H. A. Painter.
rnal of General Microbiology, Vol 52, Part 1, p 4, January 1968. 6 fig, 4 tab, 29 ref.

scriptors: *Inhibition, *Activated sludge, owth rates, Nitrification, Toxicity, Hydrogen ion ncentration, *Metals.
ntifiers: *Nitrosomonas, *Optimum values, ure cultures, Michaelis constants.

strain of Nitrosomonas europaea was isolated m activated sludge effluent by a dilution method ich readily demonstrated the presence of con- minating heterotrophs and yielded a high propor- n of tubes containing pure cultures of ammonia- idizing bacteria. Copper, sodium, calcium and gnesium stimulated growth of pure cultures, and ects of deficiencies of these metals were demon- ated. EDTA improved growth in the basal medi- ; and abolished the toxic effect of added copper; was, however, inhibitory at low calcium concen- tions. The effect of pH value on the growth of N. ropaea appeared to be dependent on the metal n content of the medium although the optimum H value was always between 7.5 and 8. The owth rate constant in pure culture was similar to at previously observed for nitrification in Thames ter, but double that previously observed for rification of sewage by activated sludge. The ichaelis constants for ammonia and oxygen bout 1 mgN/l and 0.3 mg/l, respectively) were nilar to those found for nitrification in activated dge. (Aguirre-Texas)
70-08335

HYSIOLOGICAL AND BIOCHEMICAL HARACTERISTICS OF SOME STRAINS OF ULPHATE-REDUCING BACTERIA,
ational Physical Lab., Teddington (England); and inois Univ., Urbana.
D. A. Miller, Janet E. Hughes, G. F. Saunders, d L. L. Campbell.
urnal of General Microbiology, Vol 52, Part 1, p 3-179, January 1968. 1 tab, 20 ref.

escriptors: *Classification, *Sulfur bacteria, icro-organisms, Bacteria, Sulfates.
entifiers: *DNA base composition, *Sulfate- ducing bacteria, Biochemical characteristics, esulfotomaculum, Desulfovibrio, Physiological haracteristics.

urteen previously unstudied strains of the genus esulfovibrio and eight thermophilic strains of the nus Desulfotomaculum were allotted to species the results of physiological and biochemical sts. On DNA base composition the Desulfovibrio rains fell clearly into three groups, corresponding Dv. Salexigeris, Dv. desulfuricans and Dv. Vul- ris. NaCl dependence appeared to be a constant d unique feature of Dv. salexigeris strains, and lfate-free' growth on pyruvate a constant haracteristic of Dv. desulfuricans, although one rain of Dv. Vulgaris also dismuted pyruvate. Fu- arate dismutation showed no species correlation. lfate-free' growth on choline was often minimal and the best appeared to be of little value. A high degree of resistance to Hibitane was not a constant characteristic of Dv. salexigeris. The thermophilic strains showed great uniformity in DNA base composition, Hibitane resistance and 'sulfate-free' growth, and were all classified as Desulfotomaculum nigrificans. (Aguirre-Texas)
W70-08336

CLEAN WATER AND ULTIMATE DISPOSAL,
BSP Corp., Brisbane, Calif.
Frank Sebastian, and Robert Sherwood.
Water and Sewage Works, Vol 116, No 8, p 297-300, August 1969. 5 fig, 3 tab, 6 ref.

Descriptors: *Cost comparisons, *Lime, *Sludge treatment, *Sludge disposal, *Costs, *Activated carbon, Phosphates, California.
Identifiers: *Recalcination, *Thermal systems, Lake Tahoe (California).

The unique application of thermal systems for solid waste reclamation and disposal at the South Tahoe Phosphate Removal and Water Reclamation Plant was presented. Three unique thermal processing systems were employed. Bartlet Snow Pacific multiple hearth furnaces were used in the thermal treatment systems. The first system processes a relatively wet dewatered sludge, 15-20 percent total solids, obtained from the addition of lime to raw primary sludge. Elimination of all odors and steam plume was obtained. Lime treatment of the sewerage plant effluent produces another distinct sludge which was centrifuged producing a cake of about 50% moisture. This sludge was recalcined at temperatures approaching 1900 deg F. for eventual recovery of the lime. Dry lime storage was possible without the associated dust problems by the application of a Thermal Disc Cooler. The TDC utilized water as the heat transfer liquid and decreased the temperature of the calcined lime from 1400 deg F to less than 400 deg F. There was virtually no recarbonation as the system was totally enclosed. The third system was used in the regeneration of activated carbon at the cost of $0.023 per lb. (Galwardi-Texas)
W70-08337

SCHOOL AND STATE COOPERATE FOR EFFECTIVE OPERATOR TRAINING,
Clemson Univ., Dept. of Environmental Systems Engineering, and Illinois Univ., Urbana. Dept. of Civil Engineering.
W. N. McLellon, John H. Austin, and J. F. Andrews.
Water and Sewage Works, Vol 116, No 2, p 46-49, February 1969. 2 ref.

Descriptors: *Education, *Training, Municipal wastes, Municipal water, Industrial wastes, Industrial water, Permits.
Identifiers: *Treatment plant operators, *Certification, *Manuals.

A great need exists for upgrading existing water and waste water treatment plant operator staffs both in quantity and quality. A progressive training program was instituted in the state of South Carolina in 1952 through the efforts of the South Carolina Water and Pollution Control Association and Clemson University. This program consisted of a series of correspondence courses extending through four levels of operator training. In addition, annual three-day short courses are held at Clemson followed by a certification examination. In 1966, South Carolina passed a law requiring mandatory certification of public water treatment plant operators. A similar law is expected for waste water treatment plant operator certification. Beginning in 1969, the faculty of Clemson University and the University of Illinois began a complete updating and improving of all correspondence course manuals. This set of manuals should serve as a very important tool in operator training programs. (Makela-Texas)
W70-08338

THE DECOMPOSITION OF ALIPHATIC ESTERS BY AEROBIC MICROORGANISMS,
Texas A and M Univ., College Station.
W. D. Langley, W. B. Davis, and P. A. Richards.
Proceedings Industrial Waste Conference, 23rd, p 229-241, May 1968. 7 fig, 3 tab, 12 ref. OWRR A-003-TEX, FWPCA 5T1-WP74.

Descriptors: *Biodegradation, *Cultures, *Gas chromatography, *Hydrolysis, Activated sludge, Alcohols, Byproducts, Metabolism, Oxidation.
Identifiers: *Removal rates, Esters, Substrates.

The removal of the acetate esters of C2-C6 normal alcohols has been observed in aerobic cultures of mixed population using direct injection aqueous gas chromatography as the analytical technique. The substrate-culture interaction results in the rapid hydrolysis of the ester with the appearance of the alcohol product in the aqueous phase providing its subsequent removal and oxidation is slower than the hydrolysis reaction. On a molar concentration basis, the rates of hydrolysis of the esters are virtually equal as are the rates of alcohol disappearance. In an aerated biological system, air stripping will compete with hydrolysis as a mechanism for ester removal and may constitute a significant factor in total removal. The lower molecular weight normal alcohols are relatively resistant to air stripping and will be removed primarily by biochemical mechanism. Removal rates for esters ranged from 530 to 879 mg/hr/g MLSS for ethyl acetate through n-hexyl acetate. Removal rates for alcohols ranged from 19.5 to 37.2 mg/hr/g MLSS for ethanol to 1-hexanol. (Aquirre-Texas)
W70-08340

FORMATION AND FINAL COMPOSITION OF THE BACTERIAL FLORA OF A DIARY WASTE ACTIVATED SLUDGE,
Agricultural Univ., Wageningen (Netherlands).
A. D. Adamse.
Water Research, Vol 2, p 665-671, 1968. 1 fig, 4 tab, 12 ref.

Descriptors: *Activated sludge, *Bacteria, *Dairy industry, Biological treatment, Laboratory tests, Microbiology, Milk, Waste water treatment.
Identifiers: *Coryneform bacteria, Flora, Oxidation ditch.

A comparison of the bacterial flora of a dairy waste activated sludge developing from the initial to the optimal stage in an oxidation ditch and in a laboratory apparatus, showed a close similarity between both systems, so that the latter may be used for representative experiments. Adaptation of the bacterial flora to the supplied waste was found to be a slow process. The composition of the flora altered with time until ultimately it consisted predominantly of caryneform (Arthrobacter-like) bacteria. Next to these, considerable amounts of Achromobacteraceae were found. Pseudomondaceae, initially present in large numbers, decreased to the 1 east important of the 3 major groups of bacteria. The alteration of the bacterial groups coincided with an alteration of the physiological characteristics of the total activated sludge flora. In the final stage two-thirds of the isolated bacteria gave a neutral reaction on Hugh and Leifson media and more than half were non-proteolytic. This is an agreement with the predominant position held by the group of conyneform-particularly Arthrobacter-like bacteria. The brown color of dairy waste activated sludge may be attributed to Flavobacteria. (Aguirre-Texas)
W70-08387

INFLUENCE OF SHAPE ON MIXING AND LOAD OF SEWAGE LAGOONS,
Mississippi State Univ., State College. Dept. of Civil Engineering.
Adnan Shindala, and William C. Murphy.
Water and Sewage Works, Vol 116, No 10, p 391-394, October 1969. 9 fig, 7 ref.

Descriptors: *Distribution patterns, *Mixing, *Organic loading, *Performance, *Sewage lagoons, *Shape, Waste water treatment.

Identifiers: *Influence.

The performance of sewage lagoons depends primarily on biological processes, and any factors which influence performance must necessarily be related to the biological environment of a lagoon. The most important factors which must be considered in the design and performance of an efficient lagoon are: temperature, light, organic loading, geometry, and hydraulic appurtenances. The amount of natural mixing and load distribution can be enhanced by proper selection of the size and shape of a lagoon and the location of inlets. This study presents the results of prototype experiments of various shaped lagoons. The data obtained indicate that load distribution in a sewage lagoon is influenced by the lagoon's shape. When comparing the distribution of the parameters in the entire lagoons, the rectangular lagoon showed a more uniform load distribution than its counterpart. (Aquirre-Texas)
W70-08388

EFFECTS OF PESTICIDES ON RAW WASTE WATER,
Tulane Univ., New Orleans, La. Dept. of Civil Engineering.
L. W. Canter, D. D. Nance, and D. R. Rowe.
Water and Sewage Works, Vol 116, No 6, p 230-234, June 1969. 5 fig, 4 tab, 3 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, Water pollution, Effects, *Pesticides, *Waste water treatment, Biological treatment, Dieldrin, Endrin, *Oxygen demand, Pesticide toxicity, *Bacteria, Biochemical oxygen demand, Toxicity.

The effect of commerical chlorinated hydrocarbon pesticide products on the oxygen demand of waste water and on growth characteristics of bacteria was examined. To evaluate the effect of commerical pesticide products on the oxygen demand of waste water, the BOD and COD tests were utilized. The toxic effect on the growth of bacteria was ascertained from the BOD results and from special bacterial growth studies using E. coli. In the range of 0-2 mg/l of dieldrin, the commerical dieldrin product caused an average increase in BOD of 130 mg/l for each mg/l increase in pesticide concentration. In the range of 0-5 mg/l of endrin, the commercial endrin product caused an average increase in BOD of 40 mg/l for each mg/l increase in pesticide concentration. In the range of 0-2 mg/l of equal pesticide mixtures, the average increase was 80 mg/l for each mg/l increase in the pesticide mixture. Concentrations of pure endrin up to 50 mg/l exhibited no additive effect to the BOD. The organisms were capable of surviving and growing for 24 hours in commercial pesticide concentrations up to 500 mg/l. The low solubility of dieldrin and endrin apparently inhibited the toxic action of these pesticides on bacteria. This inhibition was due to the unavailability of these pesticides for direct contact with the bacteria. (Aguirre-Texas)
W70-08389

ORGANICS REMOVAL BY A SELECTED TRICKLING FILTER MEDIA,
Texas Univ., Austin. Center for Research in Water Resources.
S. Balakrishnan, Wesley W. Eckenfelder, and C. Brown.
Water and Wastes Engineering, Vol 6, No 1, p A22-A25, January 1969. 4 fig, 2 tab, 14 ref.

Descriptors: *Biological treatment, *Efficiencies, *Filtration, *Organic wastes, *Trickling filters, Biochemical oxygen demand, Retention, Waste water treatment.
Identifiers: *Plastic media, Total organic carbon.

Organics removal characteristics of 1 1/2 inch polypropylene flexirings were evaluated. Mean residence times were determined in tracer studies using sodium chloride. Settled domestic sewage was treated in an 8 foot pilot plant trickking filter, and the organic removal characteristics in terms of BOD and TOC were measured. A correlation was developed between the specific surface of the media, applied BOD concentration, and the removal rate coefficient. Based on this correlation, it may be said that the flexiring media exhibits a removal rate of the same order of magnitude as other media having the same specific surface in terms of organics removal. Residence times studies showed that the mean residence time of a waste water through a bed of loosely packed, nonporous media was inversely proportional to the 0.45 power of the hydraulic loading rate for the media with slime. The residence time of the waste water in the medium with slime was about 5 to 6 times as large as that in a clean medium. The TOC and BOD of the feed ranged from 15.5 to 45.5 and 65 to 90 mg/l respectively. The average percent TOC removals through 8 foot depth of filter for hydraulic loadings of 12.5, 18.8 and 27 mgd per acre were respectively 57, 53, and 46. For the same conditions, the average BOD removals were respectively 66, 62, and 57%. (Aguirre-Texas)
W70-08390

THE SURFACE OF ACTIVATED SLUDGE PARTICLES IN RELATION TO THEIR SETTLING CHARACTERISTICS,
University Coll. of South Wales and Monmouthshire, Cardiff. Dept. of Microbiology.
C. F. Forster.
Water Research, Vol 2, p 767-776, 1968. 8 fig, 2 tab, 27 ref.

Descriptors: *Activated sludge, *Dewatering, *Electrophoresis, *Settling velocity, *Sludge, *Surfaces, Zeta potential, Waste water treatment, Sewage.
Identifiers: Electrokinetic properties.

The relationships of the surface properties of sewage sludges to their dewatering characteristics are reported. The measurement of the electrophoretic mobility of activated sludge particles was therefore included in the analysis of routine samples from a Lubeck pilot-plant. In constant ionic strength buffer solutions (I=0.2) no correlation was found between either the iso-electric points or the pK values of the sludge surfaces and the sludge volume index. Mobility measurements of the sludge particles in their own liquors, however, showed that the average mobility was directly proportional to the sludge volume index which in turn was a logarithmic function of the ratio of ammonia-nitrogen to soluble phosphate in the liquors. This would appear to indicate that the settling characteristics of activated sludges are governed by some metabolic process which can alter the nature of the surface of the sludge particles. (Aquirre-Texas)
W70-08391

BIOLOGICAL PARAMETERS FOR THE OPERATION AND CONTROL OF OXIDATION PONDS-II,
Department of Industries, Cape Town (South Africa). Div. of Sea Fisheries.
U. S. Tschortner.
Water Research, Vol 2, p 327-346, 1968. 9 fig, 7 tab, 24 ref.

Descriptors: *Algae, *Biological properties, Control, *Operation and maintenance, *Oxidation lagoons, Absorption, Biodegradation, Chemical oxygen demand, Chlorophyll, Lagoons, Ponds, Oxidation, Waste water treatment.

Oxidation ponds are an economical means of treatment for domestic sewage and industrial waste effluents, and are widely used in the less populated areas of warmer climates. Their action resembles the natural purification process of polluted river. They require less attention and skilled staff than mechanical systems. The successful performance of stabilization, however, depends on the biological balance of the system. The present study describes the development of parameters for the determination of the oxygen-producing community (parameters A and AP) and the efficiency of the pond on the breaking down of the load (parameter E). Parameter A reveals the relative fraction chlorophyll-bearing organisms of the total load allows a direct measurement of autotrophic p performance. Parameter AP reveals the rat photosynthesis and does not depend on variat of chlorophyll-a content of cells. Parameter based on the metabolism of algae and crustace it estimates the contribution of both to micropopulation and indicates the effectenes algae in removing pollution. Comparison of COD contributed by dissolved and suspen solids, with the calculated values for algae and algal matter of the suspended fraction, reve that in a well-balanced system more than half ob total COD is contributed by algal cells, the figu the overloaded ponds being only 20%. (Agui Texas)
W70-08392

KINETICS OF HYDROGEN ASSIMILATION THE METHANE FERMENTATION,
Engineering-Science, Inc., Oakland, Calif.
T. G. Shea, W. A. Pretorius, R. O. Cole, and E. Pearson.
Water Research, Vol 2, p 833-848, 1968. 5 fi tab, 5 ref.

Descriptors: *Fermentation, *Hydrog *Kinetics, *Methane, Bacteria, Anaerobic b teria, Anaerobic digestion, Growth rates, Labo tory tests, Mathematical models, Waste wa treatment.
Identifiers: Methano bacterium formicic Michaelis-Menten model.

The fermentation of methane from hydrogen carbon dioxide has received considerably biological engineering research emphasis than methane fermentation of organic (volatile) aci particularly acetic and propionic acids. As an ini step in determining the significance of metha production from hydrogen, this investigation undertaken to evaluate the growth and kine characteristics of a species of the methane bacte which ferment hydrogen in continuous culture. T generation time of the bacteria in the hydrogen richment fermentation was found to be 15.6 ho (hydrogen COD basis) and 13.2 hours (total CO basis); which is about one-third to one-fourth tho described for methane bacteria by McCarty et Under the normal conditions of anaerobic ferme tation of sewage sludge, hydrogen is generally l than 3% of the product gases. The saturation co stants of hydrogen in the enrichment cultu systems were found to be 569 and 724 mm Hg 75 and 95% hydrogen based respectively hydrogen and total COD removals. The results the growth and kinetic study indicate that a co tinuous flow enrichment culture, predominant hydrogen assimilating methane bacteria can characterized well by the Michaelis-Menton mod Although the methane bacteria which ferme hydrogen are capable of high substrate conversi rates, the rate of hydrogen assimulation by the bacteria in a normal sludge digestion is comput to be less than 3% of the total methane producti based on the Michaelis-Menten equation and t laboratory-determined constants. (Aguirre-Texas W70-08394

REMOVAL OF SUGARS BY ACTIVATE SLUDGE,
Water Pollution Research Lab., Stevenage (E gland).
H. A. Painter, R. S. Denton, and C. Quarmby.
Water Research, Vol 2, p 427-447, 1968. 7 fig, tab, 27 ref.

Descriptors: *Activated sludge, *Biodegradatio *Organic wastes, Oxidation, Oxygen deman Sewage, Waste water treatment.
Identifiers: *Sugars, Poly-beta-hydroxybuty acid.

Conditions are described for affecting the ability sludges, grown for the most part on sewage, remove glucose, sucrose, and fructose, the mo

mmon sugars found in domestic sewage. Sugars ere chosen for study since they comprise the ajor part of the soluble organic carbon present in mestic and other sewages. The sugars normally esent in sewage were removed from solution by tivated sludge at much the same rate as was ded glucose (40-50 mg/l/hr). The Michaelis con-ants for sugars were in the region of 10 mg/l at 20 g C. A simple relation was not found between OD loading and the ability of a sludge to remove gars, but in general the higher the 'sugar loading' e greater the activity of the sludge. At the point complete or near complete removal of sugar om solution, variable proportions of the theoreti-al amounts of oxygen were taken up, namely 10-0% for glucose and 8-26% for sucrose. No vidence of formation of significant amounts of oly-beta-hydroxybutyric acid was found in ac-vated sludge grown on sewage receiving normal mounts of glucose, though the presence of 0.5% olymer in sludge was established. It was con-luded that biochemical removal of soluble sub-rates is not a limiting factor in the activated-udge process, so that any limitation on the load pplied would appear to involve flocculation or eparation of sludge particles. (Aquirre-Texas) 70-08395

ELF-PURIFICATION IN AN OPEN DITCH,
ppsala Univ. (Sweden). Inst. of Limnology.
ils Brink.
Vater Research, Vol 2, p 481-503, 1968. 19 fig, 5 ab, 19 ref.

Descriptors: *Open channels, *Self-purification, Sewage, Flocculation, Organic matter, Pollution, Abatement, Sedimentation, Waste water treat-ment.

The self-purification of running water after pollu-ion by sewage was studied in a ditch with a small vater depth. Both during winter (0-1 deg C) and ummer a high degree of self-purification with espect both to organic matter, nutrient salts and acteria was observed within a distance of 200-300 neters and during a time less than 4.5 hour. Floc-ulation and sedimentation of organic and inor-anic substances were the predominant processes, specially in winter, but also ordinary breakdown nd building-up of organic matter and nitrification ook place. At high flow in spring and autumn, leposited bottom sludge was carried away by the tream. Such an oxidation ditch, without disturbing rainage water from the surroundings during high low, is well suited as an alternative method of reating sewage. A drop of up to about 90% in or-anic matter, nitrogen, and phosphorus over a listance of less than 300 meters was observed in vinter and summer. The same was the case with coliform and general heterotrophic bacteria to near 100%. In spring and autumn no such decreases oc-curred. An oxygen sag was found during winter and ummer. A balance between oxygen and BOD5 was eached after 350 m. In spring and autumn no sag vas found. (Aguirre-Texas)
W70-08396

THE BIOLOGY OF SPHAEROTILUS SPECIES,
Georgia Univ., Sapelo Island. Marine Inst.
John D. Phaup.
Water Research, Vol 2, p 597-614, 1968. 5 fig, 2 ab, 49 ref.

Descriptors: Bacteria, Biology, *Sphaerotilus, *Cytological studies, Nutrients, Waste water treat-ment, *Systematics, *Plant morphology.

Literature is reviewed and summarized pertaining o the taxonomy, morphology, cytology and nutri-ion of members of the bacterial genus Sphaerotilus nd present limited unpublished data. Sphaerotilus s an aerobe, although its oxygen requirements are neager. The optimum temperature is 15-30 deg C nd optimum pH near neutrality, although growth ccurs over a wide range of both. The genus Sphaerotilus consists of two valid species, S. natans Kutzing, S. discophorus Pringsheim, and possibly a third minute form which may be a subspecies of S. natans. Sphaerotilus spp. utilize a variety of organic acids, sugars and alcohols as carbon and energy sources. Glucose, however, represses synthesis of some enzymes in S. discophosus. Calcium and mag-nesium are necessary for growth. Iron and phosphates may be required in trace quantities but are toxic in low concentrations. Autotrophy remains to be proven in the genus. (Aquirre-Texas)
W70-08397

NEW WEST WINDSOR SEWAGE PLANT HAS MANY NOVEL FEATURES,
Grunwell Associates Ltd., Clarkson (Ontario).
Harry Grunwell.
Water and Pollution Control, Vol 108, No 5, p 20-21, 36, May 1970. 2 fig, 1 tab.

Descriptors: *Waste water treatment, *Treatment facilities, *Chlorination, Power system, Flow me-ters, Sludge disposal, Sludge treatment, *Sewage treatment.
Identifiers: Vortex grit removal, Windsor, Ontario (Canada).

The West Windsor Sewage Treatment Plant is an automated primary sewage treatment plant of 24 mgd, expandable to 60 mgd with secondary treat-ment. The capital costs for primary treatment, sludge removal and pumping totalled 7 million dol-lars. The plant contains several novel features: flow metering, vortex grit removal, dosage controlled chlorination, co-ordinated sludge dewatering system, closed circuit television, load sharing stand-by power sources, contract management by separate contract. The flow metering system con-sists of 2 flange mounted, propellor type flow me-ters with bearing purge systems. The accuracy of these meters over the range of pumping expected to apply, will be within plus of minus 2-3%. Grit removal is accomplished by using two, 15 ft. diame-ter aerated Vortex tanks using air lift grit removal. A chlorine residual recorder system is used to con-trol chlorination. An automatic transfer system capable of providing stand-by power within 30 seconds of power failure has been installed. Two 1800 HP/1200 KW diesel generator sets are availa-ble to supply stand-by power. The use of thickening sections in the center bottoms of primary settling tanks, an automated pumping and vacuum filtra-tion system and storage hoppers for cake storage prior to trucking are the main features of a co-or-dinated sludge removal system. (Galwardi-Texas)
W70-08398

WILMINGTON GOES ON LINE WITH MODERN NEW SECONDARY TREATMENT PLANT.

Water and Sewage Works, Vol 116, No 12, p 471-473, December 1969. 6 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Air demand, *Performance, *Design criteria, Activated sludge, Biochemical oxygen de-mand, Costs, Delaware.
Identifiers: *Air supply blowers, Wilmington (Delaware).

Completion of a $4 million secondary sewage treat-ment facility allows Wilmington, Delaware to meet federal regulations governing water pollution. The treatment facility serves a population of 500,000 persons with a combined industrial and domestic flow of 60 mgd in 1968. The secondary treatment plant consists of two aeration tanks, each 14,400 sq ft. with a combined capacity of 3,230,000 gal and two final clarifiers with a combined capacity of 3,750,000 gal. Four rotary positive blowers provide a flexible supply of air to the aeration tanks. Two blowers are equipped with constant speed 250 hp motors and two with variable speed 250 hp motors. The BOD removal is approximately 55% for both primary and secondary plants. (Galwardi-Texas)
W70-08399

WET AIR OXIDATION AT LEVITTOWN,
Lower Bucks County Joint Municipal Authority, Pa.
Paul X. Blattler.
Water and Sewage Works, Vol 117, No 2, p 32-34, February 1970. 3 fig, 4 tab.

Descriptors: *Sludge disposal, *Treatment facili-ties, Performance, *Sludge treatment, *Oxidation, *Operating costs, *Capital costs, Vacuum drying, Temperature, Waste water treatment, Pennsyl-vania.
Identifiers: Wet oxidation, Low pressure oxidation, Levittown (Pennsylvania).

Levittown, Pennsylvania has solved its sludge disposal problem with the installation of a low pres-sure oxidation unit which provides wet oxidation of its raw and digested sludge. Sludge is pumped to the process at a pressure of approximately 300 psi and is passed through a heat exchanger and heated to a temperature of 300 deg F by the outgoing ox-idized sludge before entering the reactor. A reactor outlet temperature of 340-350 deg F is obtained either from heat given off by the oxidation or by steam injected into the system. Odors are completely removed by passing the gases through a catalytic combustion unit at temperatures of 650-750 deg F. The oxidized sludge is then vacuum fil-tered without chemical additives. Typical sludge characteristics, operating performance and filtra-tion data are presented in tabular form. Capital costs were approximately $200,000 and operating costs were itemized. An operating cost of $11.10 per ton of dry solids at an operating rate of 3.65 tons per day is reported. (Galwardi-Texas)
W70-08400

SOLIDS DON'T GO TO WASTE AT WYETH,
Wyeth Labs., Philadelphia, Pa.
John A. Moffett.
Water and Sewage Works, Vol 117, No 3, p 4-5, March 1970. 5 fig.

Descriptors: *Waste water treatment, *Pre-treat-ment, Centrifugation, Performance, Activated sludge, Treatment facilities, Sludge treatment, Sludge disposal, Biochemical oxygen demand, Pennsylvania, *Solid wastes.
Identifiers: Westchester (Pennsylvania).

Pretreatment of 140,000 gpd is provided by Wyeth Laboratories before discharge into Westchester's sanitation plant. The treatment facilities consist of an equalization tank, activated sludge aeration units and clarifiers with heli-thickeners, and a cen-trifuge. Before installation of the centrifuge, excess solids either had to be raked off from the surface of the aeration tanks, or simply ended up in the plant's effluent. BOD removal of 90-95% is provided by the plant. The centrifuge provides a solids handling system and also regulates the solids content of the aeration tanks. A model P-3400 Sharples cen-trifuge is used for a period of one week in every 3 months. Input conditions to the centrifuge range from 24 to 31% suspended solids, by volume, with a 15 to 20 gpm feed rate. The solids content of the liquid effluent has been reduced to 0.5 to 7.0% and the moisture content of the cake is 95 to 96%. (Galwardi-Texas)
W70-08401

CANADA'S LARGEST SLUDGE INCINERA-TORS FIRED UP AND RUNNING.
Department of Works, Toronto (Ontario).

Water and Pollution Control, Vol 107, No 1, p 20-24, January 1969. 4 fig, 1 tab.

Descriptors: *Sludge treatment, *Sludge disposal, *Costs, *Incineration, Performance, Air pollution, Waste water treatment.
Identifiers: Multiple hearth furnaces, Air pollution control, Toronto (Canada).

Three multi-hearth sewage sludge incinerators rated at a combined capacity of 134 dry tons per

day were installed at the Main Treatment Plant at Ashbridges Bay in Toronto. The multiple-hearth furnaces are cylindrical, refractory-lined steel shells containing a series of horizontal refractory hearths located one above the other. Combustion takes place in an enclosed environment as the furnace is divided into three distinct zones of drying, combustion and cooling. Combustion temperatures are between 1400 and 1600 deg F. The loading rate in lbs/hr of filter cake to each furnace can reach 23,900 based on a moisture content of 80%. Residual inorganic ash is pumped as a slurry to a near-by lagoon. Tests of the liquid overflow show that it has a BOD of only 2 to 3 ppm. Each incinerator is equipped with a flue-gas scrubber system. This complies to a code which calls for a discharge of not more than 0.30 lb of dust per 1000 pounds of gas adjusted to 12% CO2. The incinerators were installed at a total contract price of 3.8 million dollars. (Galwardi-Texas)
W70-08402

THE NON-CHEMISTRY OF CHEMICAL TREATMENT,
McMaster Univ., Hamilton (Ontario). Dept. of Chemical Engineering.
Jack Norman.
Water and Pollution Control, Vol 107, No 3, p 18-20, March 1969. 1 fig.

Descriptors: *Water treatment, *Waste water treatment, *Chemistry, Chemical precipitation, Coagulation, Hydrogen ion concentration, Disinfection, Water softening, Chemical reactions.

Chemical treatment is practiced in almost all water and waste water treatment plants, yet its action is neither predictable nor understood in many cases. A review of various categories of attitudes that exist toward chemical treatment of water and waste water is presented. The measure of success that is used in evaluating the usefulness of some particular chemical in producing reactions in water and the lack of knowledge and lack of understanding of the chemical reaction processes occurring during the use of these chemicals are pointed out for four applications. The applications covered are the coagulation, disinfection, water softening and pH control processes. (Galwardi-Texas)
W70-08403

CONTACT STABILIZATION PROCESS CHOSEN FOR NEW DYRDEN PLANT.
Water and Pollution Control, Vol 107, No 4, p 32-33, April 1969. 2 fig.

Descriptors: *Waste water treatment, *Facilities, *Costs, *Capitol costs, Sewers, *Domestic wastes, *Municipal wastes.
Identifiers: *Contact stabilization process, Dryden, Ontario (Canada).

The contact stabilization process was chosen for the Dryden, Ontario, waste water treatment plant because the waste was predominantly domestic sewage. The plant was designed for a daily capacity of 1 mgd and a maximum capacity of 2.5 mgd with a 90% removal rate. The plant consists of a 30-foot pump station, a 10-foot diameter Dorr-Oliver-Long detritor unit, and 18-inch Chicago Pump Model C barminutor, two 500,000 gpd Smith and Lovless Oxigest biological treatment units, and a 12-foot by 30-foot chlorine contact chamber. The contact stabilization process has the two-fold advantage of reducing the size of the biological treatment units, and reducing the cost of the installation. The use of steel tanks for the biological treatment units reflected the high cost of concrete work in Northern Ontario. The total cost of the project was $1.3 million, with the trunk collector sewers costing $675,000, the pumping station $85,000 and the treatment plant $553,000. (Galwardi-Texas)
W70-08404

OZONE TREATS WASTESTREAMS FROM POLYMER PLANT,
Texas Univ., Austin. Dept. of Civil Engineering.
William W. Kwie.
Water and Sewage Works, Vol 116, No 2, February 1969, p 74-78. 3 fig, 2 tab, 15 ref.

Descriptors: *Ozone, *Organic wastes, *Biodegradation, *Waste water treatment, Oxidation, Effluent streams.
Identifiers: *Unsaturated organics, Sodium alkyl napthalene sulfonate, *Polymer plants, Waste streams.

Ozone is used to treat three separate waste streams from a polymer plant, each of which is normally resistant to biodegradation. The first stream is extremely high in chlorides, the second contains unsaturated organic compounds, and the third contains both unsaturated organic compounds and solium 8-alkyl naphthalene sulfonate-2 (SANS). The ozone reacts readily with the unsaturated organics and the naphthalene moiety of SANS. A dosage of 5400 mg/l ozone in the first stream resulted in a COD reduction of 90%. Although the naphthalene moiety of the SANS is removed by ozonation, the resulting compound proved to be no more adaptable to biodegradation than the untreated SANS. It is speculated that a culture of specially acclimated microorganisms might be developed to treat the SANS fraction. (Makela-Texas)
W70-08407

ORGANIC COMPOUNDS REMOVED BY REVERSE OSMOSIS,
Washington State Univ., Pullman. Dept. of Sanitary Engineering.
Ervin Hindin, Paul J. Bennett, and Shyamela S. Narayanan.
Water and Sewage Works, Vol 116, No 12, p 466-470, December 1969. 4 tab, 14 ref.

Descriptors: *Reverse Osmosis, *Membrane processes, *Organic compounds, Tertiary treatment, *Pesticide removal, Oil wastes, Waste water treatment, DDT, Alkylbenzene sulfonates, Linear alkylate sulfonates, *Sulfonates.
Identifiers: *Cellulose acetate membranes, Lindane, TDE (DDD).

The permeation of over 30 specific chemical species through a laboratory-scale reverse osmosis unit employing cellulose acetate membranes was determined. Chemical species investigated were those most commonly found in treated waste water effluents. Initially, the individual species in an aqueous solution or dispersion was investigated and then mistures were investigated to determine the presence of synergistic or antagonistic actions of one species toward another. Reductions of 80 to 99% were obtained for those chemical species existing primarily in the colloidal, aggregate, unicell or macromolecular form. When the species was partially in true solution and when the vapor pressure of the discrete molecule in true solution was appreciably greater than that of water, reductions of 50 to 80% were obtained. When the discrete molecules were more volatile than water, reductions were between 14 and 40%. Typical reductions for selected single chemical species are: ABS-94.0%; LAS-97.2%, Motor oil>99.7%; DDT>97.3%; Cellulose-61%; Acetone-47%. Mixtures of most of these species showed marked reductions in these results due to antagonistic as well as synergistic effects at the membrane surface. Finally secondary treatment plant effluents were applied to the system and when specific species were not present, they were added. Comparison of these results with those from single species and mixture studies indicated more effective removals were obtained for most all compounds. (Sorber-Texas)
W70-08408

CHEMICAL FEED SYSTEMS DETERMINE PLANT EFFICIENCY AND RELIABILITY,
Wallace and Tiernan, Inc., Belleville, N.J.
Robert J. Baker.
Water and Sewage Works, Vol 116, No 6, p 214-217, June 1969. 1 fig.

Descriptors: *Waste water treatment, *Des
Equipment, *Chemicals, *Flexibility con
systems, Instrumentation, Storage capacity.
Identifiers: *Chemical feed systems, Capacity.

The application, design, and control of chem
feed systems for water treatment plants is c
sidered. The typical chemical feed system
defined as consisting of chemical storage, prep
tion for feeding, feeding, preparation for appl
tion, application to the process, and related proc
and system controls. Each of these basic eleme
is discussed in regards to its importance and p
tion within the chemical feed system. In the des
of a chemical feed system seven factors are s
gested for consideration: chemical selecti
capacity, type of control, flexibility, future requ
ments, standby equipment and the need for inst
mentation. Advance planning for alternatives
provide flexibility for the most suitable chemi
for the process and the most economical pl
operating costs. Further, variation or changes
process operation can be best accommodate
chemical alternatives are considered during desi
Capacity is discussed from two view points: stor
and equipment metering ranges both of which
have considerable bearing on the flexibility a
workability of the system as a whole. Manual, fl
proportional, and feedback from process contr
are discussed. Combinations of these on the co
pound-loop control system is suggested to be
more flexible under most conditions. Over
system flexibility is obtained by selecting equ
ment with a maximum of alternate uses. This ty
design will be readily adaptable to future requi
ments as well as satisfy some requirements
standby equipment. (Sorber-Texas)
W70-08409

**A SUGGESTED FORMULA FOR THE PROCE
OF BIOLOGICAL FILTRATION,**
Water Pollution Research Lab., Stevenage (E
gland).
R. Lamb, and S. G. H. Owen.
Water Pollution Control, Vol 69, p 209-220, 197
14 fig, 9 tab, 14 ref.

Descriptors: *Formulation, *Mathematical mode
*Trickling filters, Biodegradation, Design, Filter
Hydraulic properties, Kinetics, Organic loadin
Temperature, *Biological treatment.
Identifiers: *Biological filtration, Specific surfa
area.

An equation has been developed from theoretic
considerations which relates the strength of the i
fluent and effluent of a biological filter to the flo
of sewage, volume of medium, the specific surfa
area of the medium, and the temperature of th
sewage. Good agreement with the equation ha
been found with various published data from bo
England and the USA using both conventional an
plastic media. It is hoped that the formula: (BO
sub E)/ ((BOD sub 1)- (BOD sub E)) - F x 0.039
exp. (-0.09 (T-15))/VS has been proved suff
ciently to be accepted as the basic equation fo
biological filtration. It is suggested that for design,
minimum temperature of 8 deg C be assume
When this is substituted in the right-hand side o
the equation the latter becomes F x 0.078/VS. Als
the constants have been derived from averag
values and it is recommended that when designin
a filter to produce an effluent always having a BO
of less than 20 mg/l that calculations be made usin
a BOD sub E of 15 mg/l. This will be produced du
ing all seasons of the year. (Aguirre-Texas)
W70-08410

OHIO TOWN GETS SEWERAGE SYSTEM AFTER 20 YEARS.

Water and Sewage Works, Vol 116, No 6, p 218-221, June 1969. 5 fig.

Descriptors: *Financing, *Lagoons, *Sewerage, *Waste water treatment, Ohio.
Identifiers: Economic Development Administration, *Middleport (Ohio).

fter 20 years of struggle, Middleport, Ohio, finally as its sewerage system, thanks to the help from deral financing, mostly the Economic Develop- ent Administration. Without this financial aid, uilding the system would have been impossible. or 6 years, from 1950-1956, Middleport obtained x-month dumping permits on the grounds that: a) it might be possible to build a cheaper system y combining with adjacent Pomeroy and using the me treatment plant; (b) the project was too ostly for Middleport and there were no federal nds available, (c) there was no need for the stem. On December 2, 1964, the Department of lealth, Education and Welfare offered a grant of 118,860 under WPC-Ohio 250. Council approved general financing plan in 1965 calling for the is- uance of $515,000 in mortgage revenue bonds. On ebruary 9, 1967, EDA grants were received for 114,000 and $66,400. Lagoons were selected as he least costly treatment scheme. The system was urned on September 7, 1968. (Aguirre-Texas)
W70-08411

ECENT STUDIES OF HIGH-RATE BIOLOGI- AL FILTRATION,
Water Pollution Research Lab., Stevenage (England).
A. M. Bruce, and J. C. Merkens.
Water Pollution Control, Vol 69, p 113-148, 1970. 6 fig, 12 tab, 49 ref.

Descriptors: Flow rates, Organic loading, *Trickling filters, Biodegradation, Filters, Waste water treatment, *Biological treatment, Sewage treatment.
Identifiers: *Biological filtration.

Investigation was made of performance of a tower filter, 7.1 m deep, containing Surfpac medium, when treating domestic sewage at high rates. Results showed that the average BOD removals achieved at hydraulic loadings between 6 and 18 (cum)/(sq m)d were very similar to those obtained in earlier studies with a filter of 2.1 m depth. The maximum rate of BOD removal was about 1.5 Kg/(cu m)d. An experiment to determine lateral distribution of liquid within the tower indicated that an even surface distribution is probably more important in order to achieve full utilization of the medium than is the actual rate of application. Results from a study to compare the efficiencies of various types of media for high-rate treatment of domestic sewage, indicate that performance is related in a general way to specific surface area of the medium but the actual physical configuration of the medium also influences performance. The average performances of the various filters, in terms of BOD removals, were closely related to liquid retention time characteristics. BOD removal efficiencies ranged from 32.8 to 77.5% for the various filters. (Aguirre-Texas)
W70-08412

THE IMPORTANCE OF ZETA POTENTIAL TO THE WATER INDUSTRY,
Universidad Nacional Autonoma de Mexico, Mexico City. Instituto de Geofisica.
Raul A. Deju.
Water and Sewage Works, Vol 116, No 12, p 460-464, Dec 1969. 6 fig, 1 tab, 21 ref.

Descriptors: *Zeta potential, *Waste treatment, *Waste water treatment, *Instrumentation, *Electrophoresis, Colloids, Industrial wastes.
Identifiers: *Electrophoretic mobility, Moving-boundary cell, Mass-transport cell, Microelectrophoresis.

The theoretical considerations and applications of zeta potential to the water and waste water industry are discussed. Zeta potential is defined as the charge of a particle at the periphery of its Stern layer and for aqueous solutions it is determined by measurement of electrophoretic mobility. Instruments available for measurement of electrophoretic mobility include various microelectrophoresis cells and the Long-Ross, mass-transport cell with associated power supplies and optics. Both types of instruments are described in detail. A modified microelectrophoresis apparatus suited to dilute solutions which can be employed rapidly, requires only small amounts of solution and requires no microscopic examinations is described in detail. Although the conducting unit and power supply are similar to earlier microelectrophoresis instruments, this version employs a projection and lens-filter system permitting the projections of images of the particles on a screen for rapid easy electrophoretic mobility determinations. General applications of zeta potential to the water and waste water industries are discussed including: colloid precipitation and/or dispersion, control of flocculating agent dosage, alkylbenzene sulfate or detergency control in water and waste water treatment operations and identification of the nature of the surface of living bacteria. There are other uses of zeta potential in the water industry and its uses in waste water treatment and disposal are considered enormous. (Sorber-Texas)
W70-08413

DYNAMICS OF MICROBIAL PROCESS,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
H. R. Bungay, and J. F. Andrews.
Water and Sewage Works, Vol 117, No 3, p 77-80, Mar 1970. 1 fig, 9 ref.

Descriptors: *Biological treatment, *Efficiencies, *Waste treatment, *Effluents, *Analog computers, Digital computers, Methane, Biological communities, Aerobic treatment, Anaerobic treatment, Anaerobic digestion, Waste water treatment.
Identifiers: Effluent quality, Methane production.

Although many processes are available for the improvement of effluent quality, the operation of biological waste treatment process at or near peak efficiencies provides considerable economic promise. Process control for biological treatment plants has many possibilities as well as several pitfalls due to the dynamics involved. Currently, some of the indices which can be monitored rapidly (e.g. flow rate, pH, temperature and DO) do not permit complete process control. Others such as BOD take considerable time for assay and its value as a short-term process control is limited. This problem is further complicated by sampling techniques commonly employed. Examples of control processes now in use are discussed. However, most control systems are of the feed-back type from the final effluent stream. In these cases it is often too late to correct a mistake in a biological system. Feed forward control is necessarily applied to systems with either very short or very long response times. Feed-forward control presupposes sufficient understanding of the system to predict the effects of the input notables. When applied to a biological treatment system this means a model of reasonable accuracy must be available. The Monod equation could be helpful in a control system based on population dynamics and nutrient concentration. Long-term projects to provide adequate workable process controls for anaerobic digestors and a forward-feed control system for a conventional waste treatment plant are discussed. Parameters for the digestor include methane production, temperature, pressure and flow rate. (Sorber-Texas)
W70-08414

NEW PLANT CONTROLS POLLUTION AT WELLAND.

Water and Sewage Works, Vol 116, No 11, p 434-435, Nov 1969. 3 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Costs, *Design criteria, Vacuum drying, Sludge digestion, Chlorination, Performance, Industrial wastes, Domestic wastes, Aeration.
Identifiers: *Primary treatment, Preaeration, Primary settling tanks, Welland, Ontario (Canada).

Domestic and industrial wastes which once polluted the Welland River in Ontario are now being treated at Welland's new primary treatment plant. The plant has an average capacity of 8 mgd with a peak design flow of 20 mgd. Design criteria provides for removal of 95% of grit, 70% of settleable solids and 30% of the BOD. The effluent is disinfected with chlorine and discharged to the river, while the sludge is digested, thickened and vacuum filtered. The plant was designed for future expansion to secondary treatment and a design population of 80,000. The plant features a 75 ft. lift station, a 40 in. Barminutor, a 26 ft square detritor, pre-aeration tanks with a total capacity of 190,000 gal for a detention period of 34 min; four primary settling tanks which provide a detention time of two hours; primary and secondary digesters, a vacuum filter and chlorination equipment. The treatment facility cost $2.35 million and a connecting trunk sewer system cost an additional $5.5 million. (Galwardi-Texas)
W70-08415

EFFECT OF ORGANIC COMPOUNDS ON PHOTOSYNTHETIC OXYGENATION--I. CHLOROPHYLL DESTRUCTION AND SUPPRESSION OF PHOTOSYNTHETIC OXYGEN PRODUCTION,
Texas Univ., Austin. Environmental Health Engineering Research Lab.
Ju-Chang Huang, and Earnest F. Gloyna.
Water Research, Vol 2, p 347-366, 1968. 28 fig, 3 tab, 19 ref.

Descriptors: *Algae, *Chlorophyll, Water pollution effects, *Organic compounds, *Oxygenation, *Photosynthesis, Chlorella, Pesticides, Pesticide toxicity, Photosynthetic oxygen, Productivity, *Waste water treatment.
Identifiers: *Chlorella pyrenoidosa.

This paper describes the inhibition of chlorophyll synthesis and the destruction of chlorophyll in Chlorella pyrenoidosa due to the presence of selected organic compounds. Emphasis is directed toward an explanation of laboratory techniques and an evaluation of changes in photosynthetic oxygen production due to the addition of selected compounds. Changes in extractable chlorophyll concentrations are presented in terms of exposure time and concentration of chemical additives. Selected algal cultures were grown for a test period of 72 hours in test tubes under constant temperature conditions, with continuous illumination, and under controlled nutrient supplies. Under such conditions the chlorophyll content decreases markedly in relation to the concentration of the organic additive. For the compounds evaluated, the chlorophyll reduction seems to be a function of the substituted groups and their relative positions. Also, a direct manometric technique is described for measurement of photosynthetic gas exchange. Results show that oxygen production is suppressed by chlorinated and nitrated phenols. (See also W70-08417). (Aguirre-Texas)
W70-08416

EFFECT OF ORGANIC COMPOUNDS ON PHOTOSYNTHETIC OXYGENATION--II. DESIGN MODIFICATION FOR WASTE STABILIZATION PONDS,
Texas Univ., Austin. Environmental Health Engineering Research Lab.
Ju-Chang Huang, and Earnest F. Gloyna.
Water Research, Vol 2, p 459-469, 1968. 6 fig, 2 tab, 7 ref.

Descriptors: *Design, Water pollution effects, *Organic compounds, *Oxidation lagoons, *Photosynthetic oxygen, Design criteria, Efficiencies, Laboratory tests, Lagoons, Ponds, *Waste water treatment, *Oxygenation.

The potential suppression of dissolved oxygen in ponds and streams due to decreases in photosynthetic oxygenation is described. Studies involving laboratory waste stabilization ponds, operated under controlled conditions, substantiate the predicted decrease in dissolved oxygen and

treatment efficiency. Designs for waste stabilization ponds can be improved by incorporating a chlorophyll loss factor into commonly used design equations. Toxic compounds present in waste streams may affect the operation of waste stabilization ponds in at least four ways. (a) Compounds may inhibit the photosynthetic processes and hence suppress photosynthetic oxygenation. (b) Toxic compounds may inhibit bacterial activity, and reduce the rate of biodegradation of organic compounds. (c) The biodynamic equilibrium of biological populations in the pond may be upset by the presence of certain toxic compounds. (d) Some industrial wastes are toxic and relatively resistant to biodegradation. These compounds may impose an appreciable COD concentration of the effluents. For most of the compounds reported herein, a chlorophyll compensation factor may be expressed. This may be incorporated into the general design equation for waste stabilization ponds. The design standards of waste stabilization ponds can be improved by adding a chlorophyll compensation factor to the developed design equation. (See also W70-08416). (Aguirre-Texas)
W70-08417

APPLICATION OF REVERSE OSMOSIS TO WASTE STREAMS IN CORN PROCESSING INDUSTRY, PART 1,
Ontario Research Foundation, Toronto.
F. K. Besik.
Water and Pollution Control, Vol 107, No 10, p 24-26, Oct 1969. 1 tab, 3 fig.

Descriptors: *Reverse osmosis, *Industrial wastes, *Membrane processes, Chemical oxygen demand, Biochemical oxygen demand, Carbohydrates, Efficiencies, Tertiary treatment, Water reuse, Membranes, Waste water treatment, Effluent streams.
Identifiers: *Cellulose acetate membranes, *Corn processing, Rejection ratios, *Starch industry, Flux rates, Membrane rejections, Waste streams.

The potential and reported uses of the reverse osmosis (RO) process are discussed as they apply to the starch industry, to other industries and to water reclamation. Problems such as membrane fouling and aging are addressed in light of optimum velocities, concentration polarization on the membrane surface and membrane advances. A tube-type pilot reverse osmosis unit was applied to starch wash water and the quality of its performance was judged by the determination of feed and product water total solids, total carbohydrates, COD and BOD. Three different grade membranes rated at 8, 13, and 20 gal/sq ft/day on the basis of 5000 mg/l NaCl at 800 psi were used. BOD and COD rejections were in the range of 99.5 and 97.0% and decreased with increasing membrane permeability. Total dissolved solids rejections ranged between 96 and 75% and also decreased with increasing membrane permeability. Total carbohydrate rejection removed approximately the same for all membranes at 99.5%. During the investigation it was observed that rejection appeared to be independent of initial concentration in the range investigated (0-90 g/l) and that rejection increased with an inverse in operating pressure (400-800 psi). As a result of this study it was concluded that adequate information had been obtained for a preliminary plant design for starch wash water but considerably more detail was required before final application of the design could be made. (See also W70-08419). (Sorber-Texas)
W70-08418

REVERSE OSMOSIS TREATMENT FOR CORN PROCESSING EFFLUENT--PART 2,
Ontario Research Foundation, Toronto.
F. K. Besik.
Water and Pollution Control, Vol 107, No 11, p 47-49, Nov 1969. 10 fig, 18 ref.

Descriptors: *Reverse osmosis, *Industrial wastes, *Membrane processes, Temperature, Pressure, Aging (Physical), Tertiary treatment, Water reuse, Membranes, Waste water treatment, *Effluents.
Identifiers: *Starch industry, Flux rates, Permeation constant, Membrane rejection, Corn wastes.

Specific investigations into the interrelationships between pressure drops, various flux rates for tap water and starch wash water, temperature, membrane aging, and the effect of concentration on flux rates were conducted and are discussed in detail. These parameters were considered in order to complete the design of an operating full-scale reverse osmosis system for starch wash water in a corn processing plant. It was concluded that operating pressure had no effect on the permeation constant. It was further concluded that, within the pressure limits of 400-900 psi, compression effects can be neglected for the membranes used. Flux rate was found to be linearly proportional to temperature between 10 and 35 deg C for both tap water and starch wash water and, consequently, it is desirable to operate at the highest temperatures allowed for the equipment and process employed. Flux rate decreased rapidly for increasing concentrations at low or high operating pressures. Concentrations of starch wash water ranged from 1 to 90 g/l and operating pressures from 100 - 800 psi. Short-term aging studies were also conducted (up to 100 hours operating time). Minor decreases in permeation constant were observed to occur with time but a general conclusion was not made due to the relatively short operating periods. Further, increasing the concentration of dissolved matter in the feed water results in an increase in solution osmotic pressure and a decrease in flux rate. (See also W70-08418). (Sorber-Texas)
W70-08419

FILTRATION AND MICROSTRAINING OF SECONDARY EFFLUENT,
Metropolitan Sanitary District of Greater Chicago, Ill.
Vinton W. Bacon, and Bart T. Lynam.
A paper presented at the University of Texas Conference on Advances in Water Quality Improvement, April 1, 1969. Metropolitan Sanitary District of Greater Chicago, Chicago, Ill., April 1, 1969. 41 p, 24 fig, 1 tab, 11 ref.

Descriptors: *Filtration, *Tertiary treatment, *Waste water treatment, *Water purification, *Municipal wastes, *Water reuse, Biochemical oxygen demand, Sewage treatment, Cost comparisons.
Identifiers: *Microstrainers, *Hardinge sand filter, *Suspended solids removal, Metropolitan Sanitary District of Greater Chicago, Hanover Treatment Plant.

This paper presents comparisons of efficiencies and costs of removing suspended solids, and associated BOD, from the activated sludge effluent of the Hanover Sewage Treatment Plant using both continuous rapid-sand filtration and microstraining. This is the first permanent installation of a microstrainer in a tertiary wastewater treatment plant in the United States. The sand filters are of the Hardinge type. The microstrainer is a drum 10 feet in diameter by 10 feet long covered with a stainless steel microfabric having 160,000 openings per square inch. The drum speed and backwash pressure are automatically controlled by the head loss across the drum. It was found that a rational approach for the analysis of data, relative to the performance of filtration devices in treating secondary, activated sludge effluents for removal of suspended solids, would be to consider removal as a function of suspended solids loading in terms of pounds per square foot per day. This takes into account the parameter of hydraulic loading in terms of gpm per square foot, solids input, and the resultant input from the filtration process. The costs of sand filtration and microstraining appear comparable. (Poertner)
W70-08430

INVESTIGATION OF THE FEASIBILITY OF PURIFYING MUNICIPAL WASTE WATER BY DISTILLATION,
Oak Ridge National Lab., Tenn.
I. Spiewak.
Oak Ridge National Laboratory Report ORR
TM-2547, Oak Ridge, Tennessee, April 1969. 4
9 fig, 7 ref. HUD Interagency Agreement No. IA
H-3-69.

Descriptors: *Distillation, *Municipal was
*Waste water treatment, *Water reuse, *Municip
water, *Water supply, *Water utilization, *W
purification, *Demineralization, Flash distillati
Long tube vertical distillation, Tertiary treatme
Ion exchange, Reverse osmosis, Freezing, EE
trodialysis, Nuclear powerplants, Nuclear reacto
Cost comparisons.
Identifiers: *Waste heat utilization.

The report focuses upon the technical
economic feasibility of applying the distillati
process for demineralization of municipal wa
waters. Principal applications of the method wo
be for improving the quality of effluents releas
from treatment plants to receiving streams, and
supplement water supply requirements in urb
communities. This investigation is one of a ser
sponsored by HUD to determine the feasibility
nuclear power plants for the provision of low c
thermal energy to urban areas. Distillation has t
potential roles in municipal waste treatment, one
a means of purifying waste water for reuse a
second as a step in the ultimate disposal of soli
The technical problems of waste water distillatio
described in the literature, are summarized. C
estimates are given for a number of possibl
systems using distillation to treat effluent from
city of 1 million population. The analysis indica
that, although advanced waste treatments may
crease the cost of sewage processing by factors
up to four times, the overall cost of water supp
and treatment need not be increased over abo
50%. Distillation appears to be a promising meth
of waste treatment, although methods of co
trolling tube fouling and distillate quality remain
be developed. Electrodialysis, reverse osmos
freezing and ion-exchange are also discusse
(Poertner)
W70-08431

**LAKE MICHIGAN WATER QUALITY AS R
LATED TO CHICAGO'S WATER TREATMEN
PLANTS,**
Department of Water and Sewers, Chicago, Ill.
For primary bibliographic entry see Field 05A.
W70-08433

**TERTIARY TREATMENT AT METR
CHICAGO BY MEANS OF RAPID SAND FIL
TRATION AND MICRO-STRAINERS,**
Metropolitan Sanitary District of Greater Chicag
Ill.
Bart Lynam, Gregory Ettelt, and Timothy McAloon.
This report of a study, supported in part by a gra
from the FWPCA, was presented at the Annu
Conference of the Water Pollution Control Federa
tion, September 26, 1968. Metropolitan Sanita
District of Greater Chicago, September 26, 196
86 p, 36 fig, 9 tab, 8 ref.

Descriptors: *Tertiary treatment, *Filtration
*Waste water treatment, *Water purification
*Municipal wastes, *Water reuse, Coagulation
Flocculation, Disinfection, Aeration, Water qualit
control, Municipal water, Treatment facilities.
Identifiers: *Microstrainers, *Rapid sand filtration
Hanover Plant, Metropolitan Sanitary District o
Greater Chicago.

The report is a description and evaluation of th
design and five month's operating experience at th
District's only tertiary waste water treatment facil
ty. It was put into service in 1968 at the Hanove
Plant. The facility treats the entire effluent fro
the secondary, activated sludge, treatment stage
averaging 1.5 mgd of domestic sewage. The basi
objectives of the project were to: (1) produce ef
fluent improvements in BOD, suspended solids, dis
infection and dissolved oxygen; (2) provide th
District with a research and development installa

n for advanced treatment investigations; and (3) velop design criteria for future tertiary facilities. e tertiary facility consists of chemical clarifica- n and physical separation by filtering using rdinge filters, or by straining. The straining uses e Glenfield-Kennedy micro-strainer with auto- atic control. It is the first permanent installation the United States for tertiary treatment. The cility was designed for eight different modes of eration to investigate various treatment com- nations. It was found optimum suspended solids moval was obtained by alum and polymer coagu- ion in combination with sand filtration. Both the icro-strainer and sand filter produced an effluent th suspended solids below the 5 mg/l criteria. nd filtration, with chlorination within the basin, d microstraining after chlorination by contact sin both produced effluents below the 4 mg/l iteria for BOD. (Poertner)
70-08434

EMBRANE PROCESSES GAIN FAVOR FOR ATER REUSE,
ater Pollution Research and Applications, Inc., ashington, D. C.
acob I. Bregman.
nvironmental Science and Technology, Vol 4, No p 296-302, Apr 1970. 7 p, 1 fig, 9 tab.

escriptors: *Membrane processes, *Reverse os- osis, Saline water, Pulp wastes, Costs, *Waste ater treatment, *Industrial waste treatment, Acid ine water, Water pollution control, *Tertiary eatment, Water quality, Irrigation water, Water urification, *Water reuse, Water salvage, Water eatment, Sewage treatment, Municipal wastes.
dentifiers: *Waste water reclamation, Waste water se.

lew water treatment processes are needed for leanup and reuse of water to meet future industri- l and municipal water demands. Conventional ater and waste treatment processes are only par- ally effective against the expanding list of com- ounds contaminating the lakes and rivers. An valuation of 9 tertiary treatment research and levelopment projects shows that the costs of emoving organic and inorganic nutrients range rom 26 to 30 cents per 1000 gal compared to 11 ents per 1000 gal for secondary treatment. How- ver, waste water reclaimed by tertiary treatment as a higher economic value, offsetting the higher ost of tertiary treatment. Results of field and aboratory studies are reviewed on the use of everse osmosis for reclaiming brackish water, acid ine drainage, saline irrigation return flow, paper ill waste effluents, agricultural runoff, and mu- icipal waste water. Problems remaining include: 1) creating tailormade membranes for retention r passage of specific materials, (2) preventing embrane fouling by organics and other trace con- aminants, and (3) preventing flux decline or estoration of flux. (USBR)
W70-08448

5E. Ultimate Disposal of Wastes

ULTIMATE SLUDGE DISPOSAL AND SOIL IM- PROVEMENT,
Forest Service (USDA), Washington, D.C.
James O. Evans.
Water and Wastes Engineering, Vol 6, No 6, June 1969, p 45-47. 1 tab, 10 ref.

Descriptors: *Sludge disposal, *Sludge treatment, Nutrients, Nutrient requirements, Sewage sludge, Waste water treatment, *Soil disposal fields, Pennsylvania, Soil treatment.

The value of liquid digested sludge as an agricul- ural asset is discussed in relation to the economics of sludge disposal on farm land, disease transmittal, and public acceptance of sludge disposal on land. Unthickened sludge contains 2-5% solids. The water portion of the sludge is a supplemental irriga- ion source, and both water and solids contain key nutrients and elements necessary for plant growth. The organic material forms humus, a soil conditioning substance. Sludges applied to farm land in three Pennsylvania communities resulted in higher crop yields and requests for more sludge than was available. The costs of sludge disposal on farm land depends on method of surface spreading, transport distance, mode of transport, and transport efficiency. It may be economical to pump sludge by pipeline up to 100 miles. Disease transmitting microorganisms seem to have a greater longevity in sludge treated soils. Under favorable conditions, the more common intestinal pathogenic organisms might survive up to one year. More research needs to be done in this area. Public acceptance is dependent on aesthetics, economics, and public relations. Sludge disposal on land is gaining gavor in England, where much of the current research on the subject is being done. (Makela-Texas)
W70-08405

5F. Water Treatment and Quality Alteration

A WATER/WASTE WATER GUIDE TO EUROPE, PART I: TREATMENT PRACTICES,
Detroit Metropolitan Water Services, Mich.
For primary bibliographic entry see Field 05D.
W70-08293

A WATER/WASTE WATER GUIDE TO EUROPE: PART 2: ANALYTICAL METHODS,
Detroit Metropolitan Water Services, Mich.
For primary bibliographic entry see Field 05D.
W70-08294

CHEMICAL REMOVAL OF NITRATE FROM POTABLE WATER SUPPLIES,
Kansas Water Resources Research Inst., Manhattan.
Walter J. O'Brien.
Available from the Clearinghouse as PB-193 023, $3.00 in paper copy, $0.65 in microfiche. Kansas State University Water Resources Research Institute Completion Report, Contribution No 23, June 1968. 87 p, 14 fig, 34 tab, 32 ref. OWRR Proj No A-010-KAN.

Descriptors: *Water treatment, *Nitrates, Ion exchange, Ammonia, Costs, Desalination, Water purification, Potable water, Chemical precipitation, Water chemistry.
Identifiers: Nitrate removal.

Removal of nitrate ion from potable waters by chemical reduction at alkaline pH followed by air stripping, and anion exchange using intermediate base and type one strong base resins were investigated. Nitrate reduction to ammonia by ferrous ion at room temperature in the pH range 10 to 11.5 was found to be technically feasible. The process is impractical from an engineering viewpoint, however, because chemical costs for ferrous salts and for pH control are prohibitive and because excessive concentrations of chloride or sulfate are present in the finished water. The intermediate base anion exchange resins tested, when operated on the hydroxide cycle, showed little promise. The strong base type one anion exchange resins tested, when operated on the chloride cycle, showed considerable promise. (Knapp-USGS)
W70-08461

5G. Water Quality Control

SULFIDE TO SULFATE REACTION MECHANISM--A STUDY OF THE SULFIDE TO SULFATE REACTION MECHANISM AS IT RELATES TO THE FORMATION OF ACID MINE WATERS.
Ohio State Univ. Research Foundation, Columbus.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 - Price $1.50. Water Pollution Control Research Series, February 1970. 115 p, 20 tab, 37 fig, 27 ref, 5 append. FWQA Program 14010 FPS--2/70.

Descriptors: *Mine drainage, *Coal mine wastes, *Sulfates, *Chemical reactions, *Acid mine water, *Oxidation, *Sulfides, Pyrite Ferrobacillus, Pollution abatement, Industrial wastes, Water pollution control, Oxygenation.
Identifiers: Coal mine drainage, *Reaction kinetics, Iron sulfides.

A detailed study of the mechanisms and kinetics of the chemical reactions responsible for acid mine drainage has been made. The mineralogical features of the solid phase reactant (pyrite) that determine its reactivity were described. The rate-limiting reactions and variables affecting the rate of these reactions were identified. It was found that two basic oxidation modes are important: oxygenation, in which oxygen is the immediate oxidizing agent; and ferric ion (or microbiologically catalyzed) oxidation, in which ferric ions are the oxidants. From a knowledge of the dissolved oxygen, ferric/ferrous ratio, and total iron ion content at the reaction site, the reaction regime can be determined. Kinetic equations were derived for both reaction modes. From these basic relationships the oxidation rate in real pyritic systems can be accurately predicted when conditions at the reaction site are known. For a given pyrite surface, oxygenation rate is, for all practical purposes, dependent only on the oxygen concentration in the aqueous phase surrounding the reactive site on the pyrite surface. Ferric ion oxidation rate is determined by the ferric/ferrous ratio and free ferric ion concentration in solution, and is not affected by dissolved oxygen. In a real system, the ferric/ferrous ratio is determined by a 'relative' microbial activity; i.e, the number of bacteria per exposed pyrite surface. Bacterial activity is limited by pH and oxygen concentration as well as nutrient levels.
W70-08161

AQUATIC PLANT CHEMISTRY. ITS APPLICATION TO WATER POLLUTION CONTROL,
State Univ. of New York, Syracuse. Coll. of Forestry.
Robert T. LaLonde.
Available from the Clearinghouse as PB-192 810, $3.00 in paper copy, $0.65 in microfiche. Water Quality Research Series Report. July 1970. 40 p, 7 tab, 1 fig, 26 ref. FWQA Project 16020DHVO--7/70. FWQA Contract 921141.

Descriptors: *Bacteria, *Antibiotics, *Chemistry, *Rooted aquatic plants, Aquatic bacteria, Hydrophytes, Chemical properties, Chemical analysis, Ecology.
Identifiers: *Alkaloids, *Nuphar, Nuphar alkaloids, Chemical ecology.

Possibly aquatic plants can play a role in aquatic ecology through the production and release of biologically active agents. The research objective was to determine the presence, chemical nature and biological activity of plant-produced agents. Nuphar luteum subsp. variegatum and macrophyllum produce both C-15 alkaloids and C-30, sulfur-containing alkaloids. Two of the latter type were isolated. Both were determined as stereoisomeric biscarbinolamines incorporated into two deoxynupharidine moieties linked together at C-7 through a thiaspirane ring. Two new C-15 alkaloids, 7-epideoxynupharidine and 3-epinuphamine, were discovered in N. luteum subsp. variegatum. Both C-30, sulfur-containing alkaloids were active against Corynebacterium michiganese. The more abundant of the two C-30 alkaloids was tested further against five additional phytopathogenic bacteria and was active against four of these. The same alkaloid was inactive against three bacteria taken from the site where the plant material was harvested. C-15 alkaloids, nupharidine and deoxynupharidine, were inactive against C.

michiganense, the bacteria most sensitive to the sulfur-containing alkaloids. There is now sufficient indication that Nuphar produces agents which are active against some phytopathogenic bacteria. The extent of the release of Nuphar-produced agents into the surrounding aquatic environment should be studied.
W70-08162

SPREADING AND MOVEMENT OF OIL SPILLS,
New York Univ., Bronx. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05B.
W70-08163

STUDIES ON LIMESTONE TREATMENT OF ACID MINE DRAINAGE, OPTIMIZATION AND DEVELOPMENT OF IMPROVED CHEMICAL TECHNIQUES FOR THE TREATMENT OF COAL MINE DRAINAGE.
Bituminous Coal Research, Inc., Monroeville, Pa.
For primary bibliographic entry see Field 05D.
W70-08167

JERSEY CITY V STATE WATER POLICY COMM'N (JURISDICTION OVER WATER PURITY).

191 A 456-459 (NJ Ct Err and App 1937).

Descriptors: *New Jersey, *Legislation, *Administrative agencies, *Administrative decisions, Potable water, Water quality, Public health, Percolating water, Subsurface waters, Adjudication procedure, Judicial decisions, Marshes, Evaporation, Water storage, Dams, Legal aspects, Regulation, Permits, Jurisdiction.

Plaintiff city sought review of defendant Water Policy Commission's authorization for dam construction. Plaintiff contended that such construction would endanger the purity of the public water supply and thereby constitute a hazard to public health. Defendant argued that the question of public health was not within the scope of its jurisdiction and that such questions had to be answered by the State Board of Health. The Court of Errors and Appeals of New Jersey, construing the statute creating defendant Commission, reasoned that defendant was invested with broad comprehensive powers over water management. Although the Board of Health had jurisdiction over sanitary water conditions, the court reasoned that it would be a frustration of legislative intent to say that defendant was without interest in this area. The court ruled that defendant must reconsider its decision to grant the permit, this time taking the potability of the water into consideration. (Barker-Florida)
W70-08215

EVALUATION OF POTENTIAL ACID MINE DRAINAGE,
Carnegie-Mellon University, Pittsburgh, Pa.
Robert A. Baker, and Albert G. Wilshire.
Water and Sewage Works, Vol 117, No 6, p IW/10, 12, 14, 16, June 1970. 4 p, 2 fig, 3 tab, 13 ref. FWQA Contract 14010 DKN F.

Descriptors: *Acid mine water, *Water pollution control, *Laboratory tests, Pilot plants, Leaching, Iron bacteria, Sulfur bacteria, Chemical reactions, Water chemistry, Acidic water, Acid streams, Biochemistry.
Identifiers: Acid mine drainage control.

Oxidation of iron pyrite, FeS2, exposed during coal mining results in release of acidity and ferrous iron which imposes a major pollutional loading on receiving bodies of water. Original ferrous iron release may be by dissociation or oxidation of pyrite. Subsequently, a cyclic process occurs in which the ferrous iron is oxidized to the ferric state by oxygen. In turn, the ferric iron is reduced by the pyrite generating more ferrous iron. Chemoautotrophic bacteria are known to be involved in pyritic oxidation but their precise role has not been established. Pyrite oxidation may occur without these organisms. They may directly catalyze the overall chemical reaction rates or serve as specific agents which alter the intermediate reactions and hence the nature of the resulting byproducts but not the overall oxidation rate. The chemical and biological factors are being investigated by pilot plant methods which permit achievement of equilibria under controlled dynamic conditions. Equilibria are achieved under aerobic and nonaerobic conditions, with and without biological seeding and at fixed hydraulic flow rates. Excluding oxygen does not prevent pyrite dissolution, and a steady state release of ferrous iron results under dynamic conditions. Mine sealing practices to eliminate air entry may reduce but will not eliminate acid release. (Knapp-USGS)
W70-08234

SWICK V WEST VIRGINIA COAL AND COKE CO (DAMAGE TO LAND BY MINE DRAINAGE).

7 SE2d 697-699 (W Va 1940).

Descriptors: *West Virginia, *Property values, *Prescriptive rights, *Mine drainage, Mine water, Mine wastes, Ditches, Compensation, Coal mines, Waste disposal, Pumping, Land tenure, Damages, Land use, Land appraisal, Legal aspects, Judicial decisions, Industrial wastes, Damages, Drainage, Real property.

Plaintiff, owner of certain property as a remainderman, sought recovery for permanent damage thereto. The damage was caused by defendant mining company's having discharged mine water into a ditch across plaintiff's land. Plaintiff's mother, the life tenant, had given permission to the company to use the ditch. The lower court held for plaintiff. The appellate court acknowledged the right of a remainderman to sue for permanent damages caused to his land and to recover the diminution in the market value of the property. However, the court reversed, stating that the evidence failed to show that the value of the property had been reduced by the acts complained of. The court rejected the contention of the defendant that it had acquired a prescriptive right to use the ditch, stating that a permissive use based on verbal agreement could not ripen into a prescriptive right. (Hubener-Florida)
W70-08282

INLAND STEEL CO V ISAACS (FLOOD DAMAGE FROM MINE WATER).
143 SW2d 503-505 (Ky 1940).

Descriptors: *Kentucky, *Mine drainage, *Riparian rights, *Flood damage, Water pollution sources, Overland flow, Land use, Land tenure, Legal aspects, Mine water, Watercourses (Legal), Water release, Streams, Creeks, Currents (Water), Groundwater movement, Damages, Channels, Conduits, Leases, Contracts, Water storage, Judicial decisions.
Identifiers: *Mineral deed.

Defendant steel company was engaged in mining operations in Kentucky. Plaintiff owned 150 acres of land subject to defendants' mineral deed. One acre of land, which contained plaintiff's house, was excepted from this mineral deed. Defendant's mine flooded, causing damage to plaintiff's house and the pollution of his well. The court stated that an upper landowner is liable for damages to a lower landowner if he changes the ordinary flow of a stream or causes it to collect, and then casts it upon the lower estate in a larger volume or swifter current than normal. The mineral deed only gave defendant rights consistent with the interest and rights of plaintiff. Defendant was entitled to discharge water on plaintiff's land as was necessary or convenient in accordance with the mineral deed. However, the one acre of land containing plaintiff's house and well was excepted by the deed. Consequently, plaintiff had a cause of action for damages regarding the one acre. (Leesfield-Florida)
W70-08353

DISPATCHING SYSTEM FOR CONTROL OF COMBINED SEWER LOSSES,
Minneapolis-St. Paul Sanitary District, Minneapolis, Minn.
James J. Anderson.
An Interim Report to the Federal Water Pollution Control Administration. Minneapolis-St. Paul Sanitary District, Minneapolis, Minn., May 1969. 1 p, 76 fig, 20 tab. FWPCA Project 1-Minn.-1.

Descriptors: *Flow control, *Gate control, *Control systems, *Computers, *Telemetry, *Automation control, *Regulated flow, *Pollution abatement, *Remote sensing, *Remote control, Data processing, Maintenance, Surface runoff, Sewers, Outlets, Urbanization, Monitoring, Mississippi River, Minnesota.
Identifiers: *Computer control of combined sewers, *Combined sewers, *Overflow regulators, Interceptors, Minneapolis-St. Paul Sanitary District.

The report describes a $1,741,000 demonstration project initiated as part of a national program designed to find alternatives to the costly method of sewer separation for reducing pollution of receiving waters from overflows of combined sewers. Key combined sewer regulators in the Minneapolis-St. Paul sewer system were modified. A system for remote control of these regulators and a system for monitoring liquid levels in major sewers are operational, using a small process control computer and leased telephone lines. Remote reading rain gages were connected to the system to permit using a mathematical model in the computer to predict storm flows in the interceptors and to guide operation of the regulators. To evaluate the effectiveness of these system modifications and the pollution caused by the sewer system, existing District data was converted to data processing form, the hourly strengths of wastes in the system were determined, and five robot monitors were installed to automatically record river water quality. The system, which is now operational, is said to be the most advanced of any municipal system in the United States. Significant reductions of pollution of the Mississippi River from overflows are attributed to: manual-remote monitoring of sewer levels, regulator modifications, and improved regulator maintenance. The program has demonstrated that overflow regulators can be remotely controlled using a computer-based telemetry system. The original completion date of July 1, 1969 cannot be met because of delays caused by a flood and contract difficulties. (Poertner)
W70-08435

CHARACTERIZATION AND TREATMENT OF COMBINED SEWER OVERFLOWS.
Engineering-Science, Inc., Arcadia, Calif.

City and County of San Francisco, San Francisco, California, November 1967. 202 p, 59 fig, 24 tab, 21 ref. FWPCA Grant WPD-112-01-66.

Descriptors: *Pollution abatement, *Discharge, *Overflow, *Discharge measurement, *Gates, *Outlets, *Impaired water quality, Water pollution effects, *Water pollution, *Sewage effluents, Flotation, Chlorination, Aeration, Sewerage.
Identifiers: *Combined sewer overflow, *Combined sewers, Sewer discharges, San Francisco, San Francisco Bay.

This publication is the final report of a study made by the City and County of San Francisco to develop workable systems to manage overflows from the combined sewers of San Francisco. The ultimate objective is to alleviate pollution of the Bay and the Pacific Ocean caused by sewer overflows. The

elby Street sewer system and the Laguna Street ystem were used as study sites. Storm overflows ere monitored for quantity and quality characeristics. Rain gage measurements were also ecorded. A coliform survey of the municipal arina was made, and laboratory tests were conucted to select suitable methods for treating comined sewer overflows. The project findings were: 1) concentrations of various constitutents in the verflows follow a distinct pattern; (2) the decay me is constant; (3) separation of sewers would not esult in any significant reduction in the pollution f receiving waters; (4) coliform levels in receiving aters are significantly affected by wet weather ischarges; and (5) treatment of combined sewer verflows, using the dissolved air flotation process n conjunction with chlorination, appears to be the ost feasible solution. Recommendations are made o continue the study and to construct a small treatent facility to treat the overflows from one of the inor outfalls of the City sewer system. The report ontains many figures, tables, illustrations and exellent photographs of combined sewer overflow utfalls in the San Francisco system. The two study ites comprise 15 per cent of the City's habitable rea, mostly residential in land use. (Poertner)
W70-08436

RESERVOIR MIXING AND AERATION SYSTEM,
Hinde Engineering Co., Highland Park, Ill.
H. Nelson Hinde.
Water and Wastes Engineering, Vol 7, No 3, p 50-53, Mar 1970. 4 p, 5 fig, 5 ref.

Descriptors: *Reservoirs, *Lakes, *Aeration, *Reaeration, Dissolved oxygen, Air compressors, Air entrainment, Oxygenation, Limnology, Eutrophication, Aquatic life, Mixing, Aquatic environment, *Water quality, *Impounded waters, Turnovers, Plastic tubing.
Identifiers: Reservoir management, Air bubbles, Air release valves, *Bubbles system.

A system for aerating and mixing impounded water is described. Development of the system was based on: (1) increasing horsepower efficiency to move 10 to 1000 times as much water per hp as provided by other methods, (2) reducing bubble-rise rate to less than 1 fps to eliminate turbulence and create a laminar uplift, (3) reducing bubble size to dissolve oxygen quicker, (4) inducing continuous turnover from the rise of bubbles, (5) improving water quality by eliminating anaerobic conditions at the lake bottom, (6) reducing installation and operation costs. The system uses 0.5-in.-inside-diameter plastic pipe weighted by a lead strip. Air bubble check valves are sized and spaced to meet water depth and circulation requirements. Air compressor capacity and horsepower requirements are determined according to depth and length of tubing installed. The entire bottom of the lake need not be covered; sufficient circulation will be produced by placing tubing in one or more deeper areas. In deeper lakes the water rotates slowly to a distance of 15 mi from the aeration area. Within a relatively short period, bottom water is mixed, temperatures are equalized throughout the lake, accelerated eutrophication effects are overcome, and water quality is improved. (USBR)
W70-08449

WILLIAMS V PELICAN NATURAL GAS CO (MEASURE OF DAMAGES FROM OIL AND SALT WATER POLLUTION).

187 La 462, 175 So 28-34 (1937).

Descriptors: *Louisiana, *Damages, *Water pollution, *Fishkill, Pollutants, Water pollution effects, Water pollution sources, Oil industry, Oil, Oil wastes, Oil fields, Saline water, Fish, Dams, Swimming, Recreation, Ponds, Surface waters, Trees, Stock water, Judicial decisions, Legal aspects, Water quality, Water utilization, Adjudication procedure.

Plaintiff landowners sought damages from defendant oil companies as a result of oil and salt water pollution of a stream running through plaintiffs' land. Defendants operated several oil wells upstream from plaintiffs' property and had discharged salt water and waste oil into the stream. Plaintiffs alleged damages from fish kill, destruction of a pond dam, interference with swimming, timber loss, loss of sale of fresh water, and loss of water for stock. The trial court found defendants liable and awarded damages. Defendants appealed solely on the basis of the amount awarded. The Supreme Court of Louisiana, in amending the total award, ruled that damages from the fish kill could not be ascertained in that the number of fish found dead was uncounted. Moreover, evidence showed that the fish could escape from the pond built by plaintiffs. The award for loss of water sale was also stricken since it was shown that such sale would not have occurred regardless of the pollution. Judgment for the plaintiffs was affirmed as amended. (Barker-Florida)
W70-08451

WATER STUDIES IN OREGON.
Oregon State Univ., Corvallis. Water Resources Research Inst.

Oregon State University Water Resources Research Institute Fall Quarter 1969 Seminar, WR 012.69, Corvallis; published Janauary 1970. 131 p.

Descriptors: *Conferences, *Water resources, *Oregon, Water pollution control, Lumbering, Evapotranspiration, Forest management, Land management, Fisheries, Energy budget, Radioactive waste disposal, Hydrology, Thermal powerplants, Thermal pollution, Estuaries, Water law, Recreation, Treaties.
Identifiers: Oregon State University.

Seminars in water resources at Oregon State University in 1969 are compiled. They are the product of weekly presentations which included such varied subjects as water quality, water supply, tainted fish, thermal pollution, water treaty interpretations, economic impact, and cost sharing in recreation. Some of the investigations have been in progress only a relatively short period of time and the reports are preliminary in nature. The lectures were open to faculty members, students of all ages, representatives of federal and state agencies, and the general public. (See also W70-08476 thru W70-08478). (Knapp-USGS)
W70-08475

STRATIFIED RESERVOIR CURRENTS, PARTS 1 AND 2,
Oregon State Univ., Corvallis. Engineering Experiment Station.
For primary bibliographic entry see Field 02H.
W70-08501

JERSEY CITY V STATE WATER POLICY COMM'N (CREATION OF LAKE VIA DAM CONSTRUCTION AND RIGHTS OF CITY ON RIVER BELOW).

181 A 873-875 (NJ 1935).

Descriptors: *New Jersey, *Water demand, *Impounded waters, *Water supply, Municipal water, Pollutants, Public health, Recreation wastes, Administrative decisions, Permits, Public rights, River flow, Dams, Spillways, Water storage, Riparian rights, Artificial use, Navigable waters, Reasonable use, Impoundments, Artificial watercourses, Reservoirs, Judicial decisions, Legal aspects.

Plaintiff city instituted a certiorari proceeding against the State Water Policy Commission and a realty company. Defendant realty company had been granted, pursuant to a state statute, a permit to construct a dam in a river to create a lake. Below the lake, in the same river, was a reservoir which was the source of the city's water supply. Plaintiff contended that the creation of the lake and the construction of bungalows and privies near the lake would result in a diminished and polluted water supply. The court found that the Commission had required and defendant had agreed to special conditions with regard to the construction of privies and the general use of the lake area so as to preclude pollution problems. The court also found that any reduction in the city's water supply would be minimal. The suit was dismissed with costs. (Price-Florida)
W70-08503

A STUDY OF WATER PLANT ISOLATION FROM CONTAMINATION,
National Nuclear Corporation, Palo Alto, Calif.
For primary bibliographic entry see Field 03A.
W70-08504

A TEST OF FLUSHING PROCEDURES TO CONTROL SALT-WATER INTRUSION AT THE W. P. FRANKLIN DAM NEAR FT. MYERS, FLORIDA,
Geological Survey, Tallahassee, Fla.
Durward H. Boggess.
Florida Bureau of Geology Information Circular No 62, Part 1, p 1-15, 1970. 15 p, 8 fig, 3 tab, 1 ref.

Descriptors: *Saline water intrusion, *Canals, *Water pollution control, *Locks, *Florida, Streamflow, Lowflow, Density currents, Mixing, Sea water, Navigation, Water pollution.
Identifiers: Canal operating procedures, Caloosahatchee River (Fla).

During low-flow periods, salty water from the tidal part of the Caloosahatchee River moves upstream during boat lockages at the W. P. Franklin Dam near Ft. Myers, Florida. The salty water moves upstream within the deeper parts of the river channel as far as 5 or more miles above the lock. Some mixing of the high-chloride deeper water and the fresher shallow water occurs in the affected reach above the lock, probably as a result of wind and waves, and turbulence created by boat traffic. Salt water can be flushed from the lock chamber prior to lockages at openings of 4, 6 and 8 feet. An opening of 8 feet or more appears preferable because of the smaller volume of water required and shorter discharge time involved. The quantities of salt water moving upstream can be effectively reduced by adopting changes in locking procedures. Flushing the lock chamber could result in a 50 percent reduction, whereas a combination of procedures would be even more effective in controlling salt-water intrusion. Under the present circumstances it appears unlikely that complete control and prevention of upstream salt water movement can be accomplished from a change in procedures as described; nor does it appear that complete control is entirely necessary if measures are started early in the dry season at the first indications of salt-water intrusion. (See also W70-08517). (Knapp-USGS)
W70-08516

SEIDEN V PASSAIC VALLEY WATER COMM'N (LIABILITY FOR SEDIMENT IN WATER SUPPLY).

199 A 420-423 (NJ Dist Ct 1938).

Descriptors: *New Jersey, *Water supply, *Impaired water quality, *Filtration, Administrative agencies, Filters, Water demand, Reservoirs, Plumbing, Judicial decisions, Legal aspects, Water conveyance, Water distribution (Applied), Water quality control, Potable water, Domestic water, Water purification, Conduits, Cities, Sands, Hydraulics, Hydraulic structures, Pressure conduits, Trap efficiency.

Plaintiff brought an action for damages to his plumbing system caused by the allegedly negligent failure of defendant to remove excess sand from its water supply. Defendant contended that its only duty was to deliver potable water fit for domestic

use. The court conceded that the water must be potable and fit for domestic use and also free from sediment which would affect plaintiff's plumbing. Defendant was under a legal duty to properly distribute the water, being just as liable for injuries to plaintiff's property resulting from water containing excess sand as it would be for injuries to the plaintiff's person resulting from polluted water. The doctrine of res ipsa loquitur was found to apply where the water containing the sand came exclusively from defendant's water mains into plaintiff's plumbing system. The presence of the sand in the water was an 'unusual occurrence' which made the doctrine applicable. The court found that defendant, in the exercise of reasonable care, should have discovered the presence of the sand in the water, and its failure to do so rendered it liable for plaintiff's damages. (Barnett-Florida)
W70-08519

CLINARD V TOWN OF KERNERSVILLE (DAMAGES TO LAND CAUSED BY OVERFLOW OF POLLUTED STREAM).
215 N C 745, 3 SE2d 267-272 (1939).

Descriptors: *North Carolina, *Cities, *Water pollution, *Eminent domain, Easements, Streams, Banks, Judicial decisions, Legal aspects, Shrubs, Obstruction to flow, Brush, Damages, Riparian rights, Flooding, Ditches, Municipal wastes, Sewage disposal, Environmental sanitation, Waste water disposal, Timber piles, Basins, Dye releases, Remedies, Overflow.
Identifiers: Nuisance (Continuing).

Plaintiff sought in a continuing nuisance action to recover damages to his real property caused by the pollution and overflow of a stream thereon. The stream also emitted noxious odors as a result of the pollution. The pollution was allegedly caused by emissions of waste water from defendant city's sewage disposal plant and by dye water discharged by defendant knitting mill. The overflow of the stream was allegedly caused by defendant city's filling in of the stream with timber and shrubbery. Upon finding that defendant mill had no control over the discharge of its dye water into the stream, since it deposited such water into a basin controlled by defendant city, the appellate court allowed a non-suit as to defendant mill. Defendant city was held responsible; however, the court construed the plaintiff's remedy as one in the nature of a condemnation proceeding. The court stated that except as affected by rights peculiar to riparian ownership, plaintiff's recovery did not depend on whether the damage was caused by the polluted water or noxious air therefrom. Instead, the injury was deemed a taking for which defendant city had to compensate plaintiff. After such payment defendant city obtained a permanent easement in plaintiff's land. (Barnett-Florida)
W70-08548

MICHELSEN V LESKOWICZ (DUCK FARM ON STREAM AS NUISANCE).

55 NYS2d 831-841 (Sup Ct 1945).

Descriptors: *New York, *Ducks (Domestic), *Zoning, *Diversion, Stream, Competing uses, Riparian rights, Reasonable use, Judicial decisions, Legal aspects, High water mark, Hurricanes, Bogs, Erosion, Thalweg, Boundaries (Property), Oceans, Alteration of flow, Tides, Animal wastes (Wildlife), Remedies, Adjudication procedure, Odor, Riparian land.
Identifiers: *Nuisance, Feces.

Defendant upstream riparian owner raised ducks on the stream adjoining both his and plaintiff's property. Plaintiff, a downstream owner, brought action alleging that: (1) defendant had unlawfully diverted the stream waters; (2) defendant was trespassing on plaintiff's property by use of a footpath thereupon; and (3) defendant's ducks were a nuisance in that they created odor and noise and polluted the water by fecal discharge. The appellate court held that: (1) plaintiffs were not injured by the defendant's slight scooping of soil from the creek bed, which had caused a minor recession of water from plaintiff's side of the stream; (2) defendant's use of the footpath was a trespass which should be enjoined; and (3) defendant could not be enjoined from raising ducks because of laches on the part of the plaintiff. Defendant had been raising ducks continuously on the property for 40 years, and plaintiff's failure to object within that time precluded any injunction. Moreover, the defendant's property was zoned for such purpose. Also, plaintiff had moved to the nuisance and could not therefore complain. (Barnett-Florida)
W70-08553

CITY OF LYNCHBURG V CHESAPEAKE AND O RY (PRESCRIPTIVE RIGHT OF CITY TO HAVE CANAL MAINTAINED FOR SEWAGE DISPOSAL PURPOSES).

195 SE 510-514 (Va 1938).

Descriptors: *Virginia, *Prescriptive rights, *Canals, *Sewage disposal, Easements, Land tenure, Discharge lines, Outlets, Railroads, Inland waterways, Water supply, Relative rights, Remedies, Legal aspects, Judicial decisions, Water rights, Water levels, Flow control, Public benefits, Maintenance costs, Municipal wastes, Legislation, Public rights, Aqueducts.

Defendant railroad had previously obtained permission to abandon a canal near plaintiff city. Plaintiff sought to enjoin defendant from closing the canal, claiming that it had acquired a prescriptive right to have the railroad maintain the canal at a level suitable for sewage disposal by the city. The court stated that a prescriptive right to empty sewers into private water courses could be maintained by the city. Plaintiff, however, sought to force defendant to maintain a sewage disposal system for the city at the railroad's expense. The court held that in the absence of an express contract to the contrary, such an obligation to do a positive act was not imposed on defendant by plaintiff's easement. Furthermore, the canal itself had taken on many aspects of property dedicated to a public use to which no prescriptive rights could attach. Therefore, the court held that plaintiff could not force defendant to maintain the canal. (Caldwell-Florida)
W70-08561

MAYOR OF CAMBRIDGE V DEAN (POWER OF PUBLIC OFFICIAL TO BRING SUIT TO ABATE POLLUTION).
14 NE 2d 163-166 (Mass 1938).

Descriptors: *Massachusetts, *Pollution abatement, *Local governments, *Remedies, Industrial wastes, Water pollution, Impaired water quality, Water supply, Cities, Public health, Legal aspects, Judicial decisions, Legislation, Relative rights, Water pollution control.

Plaintiff mayor of Cambridge sought to enjoin the operation of a piggery located in adjoining localities. The piggery was situated upstream, and pollution from its operation affected Cambridge's water supply. The court held that as an individual plaintiff had no right to maintain the suit, and his right as mayor was no greater than his individual right. The court indicated that had the suit been brought in the name of the city, or had a statute authorized the mayor to sue in his official capacity, a cause of action would have been stated. Although there were statutes forbidding certain acts connected with the keeping of pigs and other animals within a prescribed distance of streams, the complaint did not allege violations of these provisions. Therefore the complaint was dismissed. (Caldwell-Florida)
W70-08562

THOMPSON V CITY OF MALDEN (DISPOSAL OF SEWAGE).
118 SW2d 1059-1065 (Mo Ct App 1938).

Descriptors: *Missouri, *Drainage districts, *...ties, *Waste water disposal, Drainage, Ditch... Drainage systems, Drainage water, Sludge Tr... ment, Coliforms, Flow, Pipes, Drains, Drainage... fects, Outlets, Liquid wastes, Effluents, Sewage... fluents, Waste water treatment, Judicial decisi... Legal aspects, Waste water (Pollution), Munici... wastes, Remedies.

Plaintiff drainage district sought an injunction... restrain defendant city from connecting a se... outlet to one of plaintiff's drainage ditches. Plain... alleged that defendant was discharging noxi... chemicals and sewage into the ditch, thereby ... luting the water in violation of applicable law. ... fendant admitted such acts but alleged that: (1) ... sewage disposal plant was of the most appro... pattern; (2) the sewage was converted into an i... fensive fluid state; and (3) prior to building ... plant, defendant had obtained oral permission fr... the county court to discharge the sewage into ... ditch, although such permission had since b... revoked. From a judgment for plaintiffs grantin... permanent injunction, defendant appealed. In ... firming, the appellate court held that the act... connecting with the drainage ditch was illeg... without color of law and of itself a legal wrong... that it attempted to subordinate the ditches of ... plaintiff to a user by the city without first comp... ing with the applicable statute requiring nego... tion of a binding contract, with adequate c... sideration, between defendant and plaintiff. (B... nett-Florida)
W70-08568

RIGGS V CITY OF SPRINGFIELD (WATE... POLLUTION DAMAGES FROM DISPOSAL ... MUNICIPAL SEWAGE).
126 SW2d 1144-1153 (Mo 1939).

Descriptors: *Missouri, *Municipal wast... *Sewage disposal, *Water pollution, Water poll... tion sources, Sewage, Wastes, Sewage effluen... Sanitary engineering, Waste disposal, Effluen... Pollutants, Impaired water quality, Water pollut... effects, Fouling, Odor, Riparian rights, Judic... decisions, Damages, Relative rights, Legal aspect...

In an action for damages, plaintiff riparian la... downers contended that defendant city had em... tied sewage into a stream which crossed their lan... thereby polluting the water and creating unpleasa... odors so as to diminish the value of such land. D... fendant contended that it had appropriated the u... of such stream pursuant to statutory authorizatio... and that any claim for damages had accrued at th... time of initial appropriation. Defendant therefo... contended that plaintiffs' action was barred by th... running of a five year statute of limitation. Th... court held that the law of eminent domain applie... and not the law of nuisance. Thus the city's a... propriation through its eminent domain power ... the right to use the stream for sewage disposal pu... poses created a cause of action for permanen... damages which accrued, if at all, at the time of suc... initial appropriation. Five years having run fro... such initial appropriation, the plaintiffs' claim wa... barred by the statute of limitations. (Snow-Florida...
W70-08571

KING V CITY OF ROLLA (WATER POLLU... TION DAMAGES CAUSED BY MUNICIPA... SEWAGE DISPOSAL).
130 SW2d 697-702 (Mo Ct App 1939).

Descriptors: *Missouri, *Water pollution, *Mu... nicipal wastes, *Sewage disposal, Disposal, Im... paired water quality, Pollutants, Treatment facil... ties, Wastes, Water pollution sources, Sewage, Sep... tic tanks, Streams, Effluent streams, Wast... disposal, Sewage effluents, Sanitary engineering, Relative rights, Legal aspects, Judicial decision... Damages.

In an action for damages, plaintiff alleged that de... fendant municipality had discharged sewage from ... septic tank into a creek which flowed throug... plaintiff's land. Plaintiff contended that suc...

ischarge rendered such creek unfit for farm use nd gave off offensive odors so as to diminish the narket value of his land. Defendant contended that he action was barred by the running of a five year tatute of limitation. The court stated that under he law of eminent domain, which requires compensation for property taken by condemnation or by appropriation, a cause of action arises at the ime the use of a stream is first appropriated. Under he law of nuisance, there is a continuing accrual of a cause of action. The court held that the instant case was governed by the law of eminent domain, and consequently, since the creek was first used five years prior to the bringing of the action, the statute of limitations barred recovery. (Snow-Florida)
W70-08572

SEWER IMPROVEMENT DIST NO 1 V JONES (DAMAGES FOR IMPROPER MAINTENANCE OF SEWAGE FACILITIES).
134 SW2d 551-555 (Ark 1939).

Descriptors: *Arkansas, *Eminent domain, *Remedies, *Sewage disposal, Sewers, Cities, Waste water disposal, Municipal wastes, Ditches, Effluents, Sewage effluents, Waste water (Pollution), Conduits, Septic tanks, Structures, Pipes, Drains, Judicial decisions, Legal aspects, Odor, Water pollution effects, Riparian rights, Streams, Assessments, Damages, Compensation.

Plaintiff brought action against defendant sewer district for damages to his land occasioned by the improper maintenance and operation of a septic tank and two ditches through which polluted water crossed his land. It was undisputed that the septic tank was erected more than 3 years prior to suit and that, in fact, the tank was not properly maintained. From a verdict for plaintiff in the lower court, defendant appealed. The court found that defendant, under its right of eminent domain, had caused ditches to be dug across plaintiff's lands into which polluted water flowed. For this, plaintiff had the right to be fully compensated for any damages suffered as a result thereof, based upon the theory of a permanent taking under the right of eminent domain, if suit were brought within three years of the exercise of such right. Since that had not been done in the instant case, plaintiff's action was barred by the statute of limitations. However, the court stated that the limitation upon the time within which suits for damages must be brought does not apply to a suit to abate a nuisance. Defendant's plant, so maintained and operated as admitted in the court below, was a nuisance which could be abated through an action in equity. (Barnett-Florida)
W70-08573

06. WATER RESOURCES PLANNING

6B. Evaluation Process

ANTHROPOLOGICAL ANALYSIS OF SOCIAL AND CULTURAL BENEFITS AND COSTS FROM STREAM CONTROL MEASURES, Phase I,
Kentucky Univ., Lexington.
Henry F. Dobyns.
Project Completion Report, January 1-June 30, 1969. 8 p. OWRR A-022-KY (1).

Descriptors: *Social change, *Social impact, Kentucky, Dams, Drainage systems, Costs, Regulated flow.
Identifiers: *Anthropological data, *Social benefits, *Cultural benefits.

Anthropological research was initiated to collect data concerning social indicators to anticipate possible cultural changes in three central Kentucky river drainages as a result of dams being planned for them. The basic field research procedure broke down overall project objectives into geographic areas and methodological tasks which could be managed by individual students. A unique feature of this project was the use of secondary school students who served as research aids and kept precise household records. Papers initiated during Phase I of this project included: 'Ethnohistory and Contemporary United States Social Problems' (a summary of findings of the institutional inventory of settlements in twelve Kentucky counties); 'Economic Institutions as Social Indicators' (a paper demonstrating how anthropological data, such as kinship, may be employed as a social indicator); 'The Differential Effects of Advanced Communication, Transportation, Centralization and Affluence on Disaster Relief in a Kentucky Town' (the process of settlement competition, with selective decline and growth); 'Industrialization Without Modernization' (major socio-economic development factors made in a single county with a varied ecology); and 'Whither the Country Shore: A Special Case in the Historical Process of Institutional Centralization.' (Starr-Chicago)
W70-08150

EVALUATION OF THE SOCIAL IMPACT OF RESERVOIR CONSTRUCTION ON THE RESIDENTIAL PLANS OF DISPLACED PERSONS IN KENTUCKY AND OHIO,
Kentucky Water Resources Inst., Lexington.
Richard L. Ludtke, and Rabel J. Burdge.
Available from the Clearinghouse as PB-192 808, $3.00 in paper copy, $0.65 in microfiche. Research Report No 26, 1970. 160 p, 3 tab, 36 fig, 66 ref. OWRR Project A-020-KY (1).

Descriptors: *Social aspects, *Social adjustment, Social change, *Attitudes, Kentucky, Ohio, Population, Decision making, *Reservoirs.
Identifiers: Demography, *Migration (Population).

The states of Kentucky and Ohio have numerous reservoir projects at various stages of planning and construction. Each of the projects produces substantial social impact for the residents of the area and particularly for those persons affected by a loss of property and homes. This impact is not uniform in that people respond differently to displacement and the methods of adjusting relocation are known to differ among people. This research was initiated to develop and test a model for explaining migration under such conditions. The model includes a consideration of people's potential for transferring existing statuses to new residences, the extent to which peoples interests are served by the reservoir, people's knowledge of the reservoir, the social class levels of those displaced and the extent to which people identify with their places of residence. These factors are viewed as affecting people's levels of apprehension and consequently their willingness to separate from their current membership systems. Data for this investigation come from all the adult residents of the areas to be flooded near Taylorsville, Kentucky and Lebanon, Ohio. These areas are in the Louisville District of the U.S. Army Corps of Engineers and exhibit similar topographies with rural populations of similar socio-economic and social isolation. The testing of this model indicated that apprehensions over money is great for those persons who identify strongly with their present homes. Also, apprehension over migration was less for those persons whose vested interests were served by the project. Knowledge of the reservoir project did not reduce apprehensions over moving as was predicted by the model.
W70-08155

WATER QUALITY: COSTS BENEFITS OF IRREDUCIBLES,
Stone (Ralph) and Co., Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 05D.
W70-08328

EFFECT OF MUNICIPAL WATER SERVICE POLICIES ON ECONOMIC GROWTH IN SUBURBAN AREAS,
Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
George I. Whitlatch, and Winfred G. Dodson.
Available from the Clearinghouse as PB-193 027, $3.00 in paper copy, $0.65 in microfiche. Completion Report, Project B-367, June 1970. 62 p, 3 tab, 1 fig, 15 ref, append. OWRR Project A-024-GA (1).

Descriptors: *Industrial water use, *Municipal water policy, *Water rates, *Water costs, *Economic impact, *Community development, City planning, Georgia, Economic benefits, Local governments, Political constraints, Public benefits, Social impact, Social values.

Municipal water service policies were investigated in 27 Georgia cities to determine the effect on economic growth in suburban areas. Over 200 new industries located in or near these cities during the period, 1964-1969, of which 45 located outside of the corporate limits of 19 of these cities. Only seven of the 27 cities were judged to have formal consistent water service extension policies. The others lack a consistent policy or have none at all. Lack of consistent water service policies was found to handicap industrial development efforts of the cities and underpricing of water to industry outside the cities was notable. Principal conclusions of the study are: Extension of water service to outside industry is overemphasized and quality of service is seriously underrated; a cheap water policy is not essential to attract industry; cities should establish water rates to fully support outside service including fire protection; water service should be extended to industrial areas that can be annexed; the better municipal services of an industrial location within a city outweigh tax savings of an outside location. (Conway-Georgia Tech)
W70-08420

ATTITUDES AND ATTITUDE CHANGE RELATING TO WATER RESOURCES,
Georgia Inst. of Tech., Atlanta. School of Psychology.
C. Michael York.
Available from the Clearinghouse as PB-193 028, $3.00 in paper copy, $0.65 in microfiche. Completion Report, Apr 1970. 31 p, 47 ref. OWRR Project A-019-GA (1).

Descriptors: *Attitudes, *Social behavior, *Psychological aspects, Social aspects, Motivation, Decision-making process, Scaling, Water resources, Reviews.
Identifiers: *Attitude change, *Credibility variable, *Likert-type attitude scale.

A state of the art review was made of the nature and measurement of attitude in terms of its utility in the water resources field in Task I of a two-task project. Several methods of measurement are discussed to point up the range of approaches and data outcomes available for use among the social and behavioral science community. Task II involves an experimental investigation of the critical variable of source credibility within the attitude change process. An individual's attitude was chosen as the principal index of behavioral tendency. A Likert-type attitude scale was used for 'before-test' data gathering on the issue, fluoridation of a community water supply. The student audience then viewed a widely used public information film which portrayed the advantages of this technological innovation. The film was narrated by Dr. Spock. 'After-test' measures included attitude toward fluoridation and perceptions of the speaker or communication source. Attitudes were observed to be more favorable after the film and the credibility ratings were related positively to the expressed attitude. (Conway-Georgia Tech)
W70-08421

A FEASIBILITY STUDY IN COMMUNICATIONS EFFECTIVENESS: EVALUATING A PERSUASIVE FILM RELATING TO A WATER ISSUE,
Georgia Inst. of Tech., Atlanta. School of Psychology.
C. M. York.
Available from the Clearinghouse as PB-193 021, $3.00 in paper copy, $0.65 in microfiche. Addendum to Report WRC-0569, Water Resources Center, Georgia Institute of Technology, Sept 1969. 20 p, 2 fig, 5 tab, 13 ref, append. OWRR Project No B-024-GA (2).

Descriptors: *Social impact, *Evaluation, *Attitudes, Social aspects, Psychological aspects, Fluoridation, Water treatment, Motivation, Management.
Identifiers: Publicity evaluation, Propaganda, Sociology.

A persuasive film on water supply fluoridation was evaluated by use of attitude questionnaires, discussions, and interviews. In the pilot study among college students, the hypothesis that no significant change in attitude would be observed for the control subjects, who saw no film, was supported by a t-ratio less than unity. The pre-test and retest attitudes (average group scores) were 85.5 and 86.3 respectively, with comparable variability in rating response. Those in the film-only group exhibited a mean score of 81.4 during pre-testing, then expressed a significantly more favorable attitude (88.3) a few minutes after the film, with a significant t-value of 2.95. The 17 persons in the film and discussion group, had slightly higher favorability scores (88.1) prior to the test. Their after-film average was even higher (93.1), revealing a significant shift in attitude, with a t-value of 3.8. Inspection of the delay-scores one month later indicated a uniform reduction in the degree of favorableness. (Knapp-USGS)
W70-08422

PROMOTING AGRICULTURAL DEVELOPMENT,
International Bank for Reconstruction and Development, Washington, D.C.
Dinesh Bahl.
Finance and Development, Volume 7, Number 2, June 1970, p. 38-43, 3 photos.

Descriptors: *Irrigation programs, Land development, *Agronomy.
Identifiers: Food and Agriculture Organization, United Nations Development Programme, Green revolution, Second World Food Congress, International Finance Corporation.

The World Bank has financed agricultural development projects since 1948 but not until the 1960's did this type of assistance account for a substantial percentage of Bank loans. Irrigation projects were one of the first kinds of loan made by the Bank for agricultural development. However, although the number of irrigation construction projects is still numerous and although only 15 to 20 percent of cultivable land in developing countries is irrigated, still the Bank has realized that irrigation is merely the first step toward increased agricultural development. Extending credit loans, financing extension services and assisting fertilizer plant construction are becoming important Bank concerns as well. (Holmes-Rutgers)
W70-08427

SOCIO-ECONOMIC SIMULATION FOR WATER RESOURCE SYSTEM PLANNING,
Department of Energy, Mines and Resources, Ottawa (Ontario).
Peter J. Reynolds, and Asit K. Biswas.
13th Congress International Association Hydraulic Research Proceedings, Vol 1, p 75-82, Aug-Sept 1969. 8 p, 1 tab, 21 ref.

Descriptors: Water resources, Water resources development, *Economic feasibility, *Simulation, River basin development, *Social aspects, Mathematical models, *Models, Economics, Ecology, Effects, *Sociology, Human resources, Decision making, Bibliographies, Evaluation, Planning, Multiple-purpose projects, Reviews, Policy matters.
Identifiers: Regional planning, Human relations, Canada, Alternatives.

The current status of socio-economic simulation in water resource planning is reviewed. Efficient allocation of limited national resources among a variety of competing government programs can be achieved only by measuring their relative cost-effectiveness. This can be done by evaluating social, political, and economic effects on human beings. Until national and basin socio-economic models are available, evaluating alternative public policy programs on disparate regions and distinct socio-economic groups would be difficult for policy planners. The state of the art in socio-economic modeling has advanced sufficiently to be useful in water resource policy planning and decisionmaking. Modeling also gives the analyst a better insight into the various interactions within the complex processes, and will point out methods for dealing with the socio-economic phenomena associated with water resource system design. Up to now, ecology has not been considered. If water resource policy planning is to be more effective, a comprehensive system must be developed incorporating the interdependence of a multi-region, socio-ecologic system that would allow more satisfactory sets of policy alternatives to be evaluated. (USBR)
W70-08453

WATER RESEARCH SUMMARY.
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 09D.
W70-08473

THE ARIZONA WATER CONTROVERSY: AN ECONOMIST'S VIEW,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
Robert A. Young.
Journal of the Arizona Academy of Science, Vol 6, No 1, p 3-10, March 1970. 16 ref.

Descriptors: *Cost-benefit analysis, *Water demand, *Arizona, *Economic justification, *Economic impact, Water costs, Water allocation (Policy), Water distribution (Policy), Administrative agencies, Competing uses, Equitable apportionment, Irrigation practices, Irrigation programs, Water resources development, Water supply, Water utilization, Benefits, Costs, Planning, Productivity, Project feasibility, Employment, Social impact, Budgeting, Wages, Value.
Identifiers: *Central Arizona Project, *Direct value of water, Marginal economic sectors.

For the past 2 decades water policy planners in Arizona have assumed that state economic well-being and growth is crucially dependent on augmented water supplies. However, during the same period, and without augmented water supplies, the state has registered growth rates of 200-600 percent. Returns per unit of water intake are 16 dollars per acre foot in the grain and forage sector and 80,000 dollars per acre foot in the manufacturing sector. The nonagricultural sectors of the economy have increased about ten-fold since World War II, and there is much evidence to indicate that agriculture has at least held constant, despite many assertions to the contrary. A cost-benefit analysis of the Central Arizona Project estimates that added returns to the state will be considerably less than one-half the associated cost, causing hardships for the large non-agricultural proportion of the economy. It is concluded that: (1) Agriculture is a marginal sector contributing relatively little to the state economy, and is unimportant to future economic growth (2) Current water resources are adequate for projected growth in the non-agricultural sector (3) The projected benefit-to-cost ratio does not justify a water augmentation scheme and could lead to large losses of public funds. (Cas
Arizona)
W70-08532

ENVIRONMENTAL THREAT AND SOCIAL OC GANIZATION,
International Union of Anthropological a Ethnological Studies.
Lawrence Krader.
The Annals of the American Academy of Politic and Social Science, Vol. 389, May 1970, p 11-18 ref.

Descriptors: *Social values, *Environme Management, Costs, Attitudes.
Identifiers: *Social organization, *Environmen threat, Society, Policy, Environmental problem Ecology of abundance, Ecology of scarcity.

The mental approach of the natural scientist to th study of the physical environment contrasts wi the social science approach. The unit of study is th same: in both cases it is the society, but instead value-free adaptations (of the natural sciences: the social sciences tend to evaluate environmenta relations as beneficent or dangerous to man. Ame ican society has its adaptive niche on the Nort American continent, but in its brief history, w note a change in attitude from the first settler: confident belief that nature will provide for man wants, to our present sense of the threat to socia existence generated by environmental problems This is coupled with a growing conviction that pas policies of uncontrolled depletion have brough about the change from an ecology of abundance to an ecology of scarcity. We are passing through climacteric at present regarding quantity and quali ty of water supply, and as we change ou philosophy of natural resources generally, so do we change our management policies toward them in particular. We are making up our minds that wha was cheap or free will now become expensive. The pills of rising costs and taxes are a bitter dosage (Davis-Chicago)
W70-08543

SOCIETY AND ITS PHYSICAL ENVIRON- MENT.
American Academy of Political and Social Science.

Annals of the American Academy of Political and Social Science, Vol. 389, May 1970.

Descriptors: *Enviroment, *Social aspects, *Management, *Planning, Economics, Legal aspects.
Identifiers: *Metropolitan water resource management, Environmental threat, Environmental usufruct.

Numerous aspects of the relationships between society and its physical environment are explored. Among the general topics discussed are: the nature of environmental threat; society, personality, and environmental usufruct; the economics of common environmental property; emerging environmental law; and organizing for environmental planning. A number of larger issues that are basic to metropolitan water resource management are examined in this collection of articles. (Davis-Chicago)
W70-08544

THE CHARISMATIC AND THE PLAYFUL IN OUTDOOR RECREATION,
City Univ. of New York.
Rolf Meyersohn.
Annals of the American Academy of Political and Social Science, Vol. 389, May 1970, p 35-45. 1 tab, 46 ref.

Descriptors: *Recreation, *Social aspects, Social values.
Identifiers: *Charisma, Play.

ricking parallels exist between the concepts arisma and play. Both refer to a quality or an ientation rather than a behavior or an activity. oth are seen as innate to humans, yet scarce ecause of lack of opportunity and lack of cultiva- on, as well as lack of talent or 'genius'. Charisma well as play is related to vital processes and is anscendent, featuring the extraordinary. harisma and play are contrasted with the routine nd reject it. Separateness and segregation are in- erent in charisma and play; yet both become rou- nized, stylized, institutionalized. The elaborate nd complex nature of these concepts is illustrated y examining a study of wilderness-camping in hich qualities of experience are expressed that an be derived from the elements of charisma and lay. These qualities are more readily experienced y persons who are trained to experience them; ost leisure-activities are not felt to be so moving touching, and outdoor recreation as well as the est of the activities which occupy us during our ree time are not usually endowed with transcen- ent qualities. (Davis-Chicago)
W70-08546

ADAPTATION UNDER EXTREME ENVIRONMENTAL CONDITIONS,
Pennsylvania Univ., Philadelphia.
George E. Ruff.
Annals of the American Academy of Political and Social Science, Vol. 389, May 1970, p 19-26. 1 fig, 6 ref.

Descriptors: *Environment, Equilibrium, Ecology, Stress.
Identifiers: *Adaptative mechanisms, *Systems, Feedback mechanisms.

Living systems tend to maintain in equilibrium variables associated with their continued existence. Environmental conditions which force these variables beyond their normal ranges produce stress within the system. Feedback mechanisms then seek to restore equilibrium. Stress arises from overloads or underloads of energy and information, as well as from inputs which have threatening implications. The process of adapting to stress depends partly on the nature of the stress-producing agent and partly on the mechanisms available to the system. When the system is subjected to extreme environmental conditions for an extended period of time, adaptative responses may become increasingly costly. A possible outcome is one of the 'diseases of adaptation.' Eventually, adaptative mechanisms may fail and the system may collapse. The stress encountered by most individuals arises from the symbolic, rather than the physical, aspects of their environment. Further, most studies of men under stress reveal a remarkable capacity for adaptation to extreme environments. (Davis-Chicago)
W70-08547

6D. Water Demand

CLIMATIC ESTIMATES OF AVERAGE AND PROBABLE IRRIGATION REQUIREMENTS AND OF SEASONAL DRAINAGE IN CANADA,
Department of Agriculture, Ottawa (Ontario). Plant Research Inst.
For primary bibliographic entry see Field 03F.
W70-08216

ECONOMIC GUIDELINES FOR LAND AND WATER RESOURCE USE IN AGRICULTURE,
Alberta Univ., Edmonton. Dept. of Agricultural Economics.
Travis W. Manning.
Canadian Journal of Agricultural Economics, Vol. 17, number 3, November 1969, p 1-8. 13 ref.

Descriptors: *Water allocation (Policy), Recreation demand, Resource allocation, Economics, *Water demand.
Identifiers: *Federal Task Force on Agriculture, Economic Council of Canada.

Agriculture in Canada is faced with growing problems of overproduction, low farm incomes and too many farmers. The author discusses non agricultural uses of land and water resources, stressing particularly recreational uses. Although many of the factors considered in land and water allocation are the same, water resource use is more economically calculable and can be measured as a capital input more readily. Nonetheless the effects of water resource development projects may be as difficult to reverse as land use projects. Therefore, the author urges more careful consideration of the benefits and disadvantages of new water resource development particularly in western Canada. (Holmes-Rutgers)
W70-08432

REPORT TO THE REGIONAL PLANNING COUNCIL, BALTIMORE, MARYLAND ON A PLAN FOR REGIONAL WATER SUPPLY TO THE YEAR 2020, VOLS. I, II.
Hazen and Sawyer, New York.

Financial assistance provided by HUD under Section 701 of the Housing Act of 1954. June 1969.

Descriptors: *Water demand, *Water supply, *Water works, *Water distribution, *Water treatment, *Municipal water, *Cities, *Planning, *Water resource development, *Comparative costs, *Water shortage, *Reservoir sites, Urbanization, Long term planning, Future planning, Capital costs, Construction costs, Forecasting, Waste water treatment, Water reuse.
Identifiers: *Baltimore, *Potomac River, *Susquehanna River, Baltimore Regional Planning Council.

This two-volume report to the Baltimore Regional Planning Council presents findings and recommendations resulting from a study of the water supply needs, to the year 2020, of the City of Baltimore and the counties of Anne Arundel, Baltimore, Carroll, Harford and Howard. The engineers estimated that the present 2 million population will grow to 4.8 million persons by the year 2020. Average water demands on public systems, including industrial requirements, are expected to increase from 265 mgd to 900 mgd during the period. Maximum-day water demands in various parts of the service area will range from 40 to 70 per cent more than average use. The average water deficit by the year 2000 is estimated at 120 mgd, and 350 mgd by the year 2020, if water supply capacities are not increased. The sources of water supply best suited to regional development are the Susquehanna River at Conowingo, Deer Creek in Harford County, and the Potomac River. Conversion of sea water and reclamation of sewage and industrial wastes are not recommended because of high costs and lower quality. Volume I of the publication contains the main text and recommendations. Volume II contains 12 appendices which serve as documentation. (See also W70-07848 and W70-07849) (Poertner)
W70-08437

REPORT TO THE REGIONAL PLANNING COUNCIL, BALTIMORE, MARYLAND ON A PLAN FOR REGIONAL WATER SUPPLY TO THE YEAR 2020, VOL. I-MAIN TEXT.
Hazen and Sawyer, New York.

Report, June 1969. 180 p, 25 fig, 23 tab.

Descriptors: *Water demand, *Water supply, *Water works, *Water distribution, *Water treatment, *Municipal water, *Cities, *Planning, *Water resource development, *Comparative costs, *Water shortage, *Reservoir sites, Urbanization, Long term planning, Future planning, Capital costs, Construction costs, Forecasting, Water reuse.
Identifiers: *Baltimore, *Potomac River, *Susquehanna River, Baltimore Regional Planning Council.

Water supply requirements and recommendations for facilities to the year 2020 are detailed in this report to the Baltimore Regional Planning Council. The service area includes the city of Baltimore and its five contiguous counties. The engineers made the following recommendations: (1) develop a 570 mgd water supply from both the Potomac and Susquehanna Rivers, and enlarge the W.S.S.C. Triadelphia Reservoir from 7 to 40 billion gallons; (2) promptly acquire land on Deer Creek for the Darlington Reservoir; (3) negotiate with the Washington Suburban Sanitation Commission regarding the purchase or lease of Triadelphia Reservoir and acquire land for enlargement (if negotiations fail, purchase the Gillis Falls site); (4) Carroll County should acquire sites for the proposed new Windsor Reservoir (in addition to Piney Run and Union Mills), and a 5 billion gallon reservoir on Gillis Falls if the latter is not used for the central supply system; (5) detailed engineering and comparative cost studies should be made to permit prompt acquisition of land and rights-of-way for (a) treatment plants and sludge disposal, (b) transmission main routes, and (c) ground storage reservoirs; and (6) adequate staff and funds should be made available soon. (See also W70-08437) (Poertner)
W70-08438

REPORT TO THE REGIONAL PLANNING COUNCIL, BALTIMORE, MARYLAND ON A PLAN FOR REGIONAL WATER SUPPLY TO THE YEAR 2020, VOL. II-APPENDICES.
Hazen and Sawyer, New York.

Report, June 1969. 114 p, 33 fig, 35 tab, 81 ref.

Descriptors: *Water demand, *Water supply, *Water works, *Water distribution, *Water treatment, *Municipal water, *Cities, *Planning, *Water resource development, *Comparative costs, *Water shortage, *Reservoir sites, Urbanization, Long term planning, Future planning, Capital costs, Construction costs, Forecasting.
Identifiers: *Baltimore, *Potomac River, *Susquehanna River, Baltimore Regional Planning Council.

This publication contains 12 detailed appendices that serve as documentation for Volume I which presents estimates of the water supply requirements of Baltimore and its 5 contiguous counties to the year 2020. The following appendices are included: (A) Hazen and Sawyer Memorandum of May 16, 1968 to the Baltimore Regional Planning Council, which includes population projections by Johns Hopkins University, Maryland State Planning Department, Hammer and Company, Baltimore Regional Planning Council, National Planning Association, and the U. S. Department of Commerce; (B) Baltimore Regional Planning Council Population Forecasts; (C) Comparison of Population Forecasts With Forecasts By Others; (D) Hazen and Sawyer Water Consumption Forecasts; (E) Hazen and Sawyer Industrial Water Memorandum, dated November 1968; (F) Hydrology of Existing Baltimore Watersheds; (G) Basis of Cost Estimates; (H) Project Reservoirs; (I) Susquehanna Basin Date; (J) Potomac Basin Data; (K) Project Phasing For High and Low Population Forecasts; and (L) Bibliography. The appendices contain discussions together with many tables and figures. (See also W70-08437) (Poertner)
W70-08439

THE ARIZONA WATER CONTROVERSY: AN ECONOMIST'S VIEW,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 06B.
W70-08532

6E. Water Law and Institutions

ETHNOHISTORY AND CONTEMPORARY UNITED STATES SOCIAL PROBLEMS,
Kentucky Univ., Lexington.
Henry F. Dobyns.

Available from the Clearinghouse as PB-192 761, $3.00 in paper copy, $0.65 in microfiche. Paper presented at 17th Annual Meeting, American Society of Ethnohistory, Ithaca, New York, October 24, 1969. 22 p, 1 tab, 36 ref. OWRR Project A-022-KY (2)

Descriptors: *Social change, *Social impact, *History, Kentucky, Dams, Drainage systems, Regulated flow, Ecological distribution, Community development.
Identifiers: *Ethnohistory, *Anthropological data, *Social benefits, *Cultural benefits.

Research was initiated by anthropologists in three study units in Kentucky to ameliorate critical social conditions. The research was based on three basic policy assumptions: (1) a society can only afford to finance science activity whose findings can be utilized; (2) anthropologists should be aware of the policy implications of their research; and (3) the anthropologist theory should withstand the test of application to practical problems. The research objective was to compile cultural data for a baseline description of the units being studied in 1969-1970 before stream-control measures are taken. Future research in this project is aimed at measuring cultural change produced by these stream-control measures. The theory of community development is being tested; research has uncovered evidence that there is competition between settlements in Kentucky for population and institutions. Subcultural difference implying historical divergence exist between members of one ethnic group in counties within even a limited portion of a single state. The study of water use and management in these study areas in Kentucky focuses upon historic cycles in ecological influences. (Starr-Chicago)
W70-08151

INSTITUTIONAL FACTORS AND THE TEXAS WATER PLAN,
Texas A and M Univ., College Station. Dept. of Agricultural Economics and Sociology; and Texas A and M Univ., College Station. Water Resources Inst.
Warren L. Trock, and Clarence W. Jensen.
Water Resources Bulletin, Vol 6, No 2, p 261-268, March-April 1970. 8 p, 21 ref. OWRR Project No B-025-TEX.

Descriptors: *Water resources development, *Planning, *Water law, *Institutions, *Mississippi River, Legislation, River basin development, Water allocation (Policy), Water transfer, Inter-basin transfers, Water rights, Interstate, Interstate rivers.
Identifiers: Texas Water Plan.

Among the many problems associated with the implementation of the Texas Water Plan are the institutional arrangements necessary for interstate diversions, for management of transfer systems, for allocation and sale of water, and for developing repayment capabilities among water users. To make a transfer system functional, a diversion in perpetuity is necessary. There will be important private and public resistance to diversion from the Mississippi because (1) it is navigable for a good portion of its length, (2) its waters are shared by several states, (3) there is considerable economic dependence on the stream, (4) it has significant subjective value and (5) other considerations create demands for maintenance of the river in its present state. (Knapp-USGS)
W70-08188

DAVIDSON V VAUGHN (CONVEYANCE OF A RIGHT TO WITHDRAW WATER FROM A NATURAL WATERCOURSE).

44 A2d 144-149 (Vt 1945).

Descriptors: *Vermont, *Streamflow, *Usufructuary right, *Water sources, Discharge (Water), Water management (Applied), Diversion, Judicial decisions, Legal aspects, Routing, Bypasses, Diversion structures, Springs, Fresh water, Water supply, Relative rights, Contracts, Water users.

Plaintiff and defendant, adjacent land owners, entered into an agreement in which defendant granted to plaintiff a perpetual right to tap a spring and the brook flowing therefrom, and to convey the water from said spring and brook by suitable means. Plaintiff was building a cottage on his land and was taking lawful advantage of his agreement with defendant when his house was destroyed. He constructed a larger house at a higher elevation and, to utilize the spring water, he had to build a spring house and draw water from the brook, instead of the spring, as had previously occurred. Defendant attempted to prevent plaintiff's use of the water. Plaintiff brought suit to restrain defendant's acts. The court held that conveyance of a perpetual right to tap a spring and brook is not limited as to place or method, and a grantee's right to take water is not limited to the place where the water was being taken from at the time the conveyance was executed. Consequently plaintiff had the right to take the water directly from the spring or from any part of the brook that issues from it. (Barnett-Florida)
W70-08190

TAIT V FIRST FEDERAL SAVINGS AND LOAN ASS'N (SUIT TO RESTRAIN INTERFERENCE WITH WATER RIGHTS).
132 N J Eq 493, 28 A2d 764-765 (1942).

Descriptors: *New Jersey, *Easements, *Pipelines, *Reservoir storage, Water supply, Judicial decisions, Legal aspects, Wells, Water wells, Reservoirs, Domestic water, Water demand, Pipes, Distribution systems, Land tenure, Real property, Relative rights.
Identifiers: Grants (Deeds).

Suit was brought by complainant to restrain threatened interference with water rights granted to her. Complainant was the grantee of land adjacent to land held by her grantor. The deed from grantor to complainant contained a grant of water rights in an existing water supply on the grantor's land. The grant permitted the running of pipes across the grantor's land to conduct the water. Two years after the grant the source of water supply was changed by the grantor from a reservoir to a well, to which complainant connected her pipes under an oral agreement with grantor. Defendant took a mortgage on the grantor's lands with constructive knowledge of complainant's easement and rights in the water. Defendant contended that the easement that did exist was terminated by a change in the source of supply. The court found this contention unsound since it placed too narrow a construction on the deed and did not take into consideration the facts and circumstances involved. At the time of the execution of the mortgage, the grantor would have been estopped from interfering with complainant's rights to obtain water since by his own acts he had cut off the reservoir supply. This estoppel extended to defendant mortgagee. (Barnett-Florida)
W70-08192

HANSEL V COLLINS (RELATIVE RIGHTS OF ADJOINING LANDOWNERS IN WATER PIPELINE).

23 A2d 686-690 (Md 1942).

Descriptors: *Maryland, *Prescriptive rights, *Easements, *Pipelines, Land tenure, Boundaries (Property), Real property, Legal aspects, Compensation, Water supply, Domestic water, Relative rights, Water demand, Water utilization, Judicial decisions.
Identifiers: *Injunction.

Plaintiff and defendant held adjoining tracts of land from a common grantor. Defendant's predecessor in title had constructed to his house a water pipeline which ran across a corner of plaintiff's land. Defendant's predecessor in title granted to plaintiff's predecessor in title permission to use water from the line. Defendant subsequently demanded that plaintiff either pay for use of the water or disconnect from the pipeline. When plaintiff refused, defendant began to construct a pipeline around plaintiff's property. Plaintiff sought to enjoin interference with his use of the line. Defendant asked an injunction against plaintiff's use. The court held for defendant stating that, since plaintiff's predecessor in title had not contributed to the cost of constructing the line nor given permission for it to cross his land, plaintiff could not claim ownership of the line as a successor in interest. An implied grant of easement could not be found since the common grantor had conveyed plaintiff's estate after conveying defendant's estate and there had been no express reservation of an easement over plaintiff's land. A prescriptive right to use the pipeline could not be claimed since the water had not been taken adversely for a 20 year period. (Hubener-Florida)
W70-08199

TOY V ATLANTIC GULF AND PACIFIC (LIABILITY FOR FILLING OF CREEK BED).

4 A2d 757-767 (Md 1939).

Descriptors: *Maryland, *Dredging, *Accidents, *Access routes, Engineering structures, Channel improvement, Excavation, Embankments, Concrete structures, Damages, Obstruction to flow, Riparian rights, Beds under water, Navigable waters, Ownership of beds, Navigation, Transportation, Fishing, Collapse, Buckling, Weirs, Canal construction, Failure (Mechanics), Canals, Judicial decisions, Legal aspects, Fish farming.
Identifiers: *Negligence.

Plaintiffs owned land along a certain creek. Plaintiffs controlled the entry of water from the creek into a ravine, in which they raised carp, by operation of a weir. Defendant dredging company deposited large quantities of dredged earth along the creek near plaintiffs' tract of land and constructed an embankment to confine the excavated material. The embankment gave way sending large quantities of earth into the creek and cutting off access by water to plaintiffs' ravine. Plaintiffs sued for damages. The court acknowledged that although water in the creek was shallow and plaintiffs held no title to the creek bed below the high water mark, they were entitled as riparian proprietors to enjoy such floatage as the creek would provide. Deposits placed in the channel impeding its use were unlawful. However, the court gave judgment for defendant, holding that the mere happening of the accident did not prove negligence. The exercise of reasonable care could not have ascertained a defect in the embankment structure, and res ipsa loquitur did not apply since defendant was not shown to be at fault. Liability without fault did not apply since defendant did not own or occupy the site of the deposits. (Hubener-Florida)
W70-08206

CHAPMAN V DELK (LOSS OF MILL-DAM FLOODING EASEMENT DUE TO OPERATION OF STATUTE).

16 SE2d 379-383 (Va 1941).

Descriptors: *Virginia, *Easements, *Mill dams, *Flooding, Ponds, Confined water, Legal aspects, Judicial decision, Impounded waters, Water levels, Water level fluctuations, Surface waters, Dams, Water control, Eminent domain, Mills, Relative rights, Legislation, Compensation, Lakes, Land tenure, Real property.
Identifiers: Statutes of limitation.

The complainants owned land adjacent to a mill pond. The defendant held an easement to flood lands above a dam on the pond. After the mill had been out of use for forty years, the defendant sought to raise the level of the pond by five feet and to further flood the land of the complainants. Complainants sued to terminate the defendant's right to do so. The mill pond, a dam and grist mill had been developed between 1836 and 1856 pursuant to a

tate statute. The statute provided that under certain conditions private property could be taken to establish a grist mill. A forfeiture provision of the statute stated that if the mill were destroyed or rendered useless, and repairs not begun within two years, the title to the land would revert to the original owner, their heirs or assigns. The appellate court held that as the mill had been abandoned for forty years, the title reverted to the original owners and the easement to flood lands extinguished. (Price-Florida)
W70-08264

COGSDALE V HOWARD (DISPUTE TO TITLE OF POND).

195 SE 514-516 (Va 1938).

Descriptors: *Virginia, *Beds under water, *Ownership of beds, *Easements, Lake beds, Land tenure, Boundaries (Property), High water mark, Legal aspects, Lakes, Boundary disputes, Mill dams, Artificial use, Real property, Judicial decisions, Relative rights, Prescriptive rights, Mills, Ponds.

Plaintiff and defendant disputed ownership of a millpond. Plaintiff owned a grist mill and mill dam situated on the pond, and claimed the pond on the basis of words in the deed from his grantor which allegedly conveyed to him the real estate 'being the same purchased by grantor.' The grantor had purchased title to the pond but the pond was not specifically mentioned or described in the deed of conveyance. Defendants claimed ownership of the pond as heirs at law of the grantor. The court held for defendants stating that plaintiff had never acquired title to the mill pond either by purchase or adverse possession. The 250 acre pond was not appurtenent to the grist mill or to plaintiff's small tract of land. Plaintiff held only an easement in the water of the pond for the purpose of operating the grist mill. (Hubener-Florida)
W70-08325

SUTTON V TERRETT (ACCRETIONS AS INCIDENT TO RIPARIAN OWNERS WHOSE GRANT RUNS ONLY TO STREAM BANK).
301 Ky 506, 192 SW2d 382-385 (Ky 1946).

Descriptors: *Kentucky, *Accretion (Legal aspects), *Boundary disputes, *Boundaries (Property), Riparian rights, Judicial decisions, Legal aspects, Water law, Bank erosion, Acreage, Alluvial channels, Navigable waters, Streams, Ownership of beds, Riparian land, Rivers, Mississippi River, Channels, Relative rights, Land tenure, Real Property.

Twenty-one years prior to this action, a homestead which bordered on the south bank of a dual-channeled river was divided into seven tracts. The tracts were allotted to seven of nine heirs of the deceased owner. Subsequent to this division, the south channel of the river shifted north, causing land to accrete to the south bank, Plaintiffs, three heirs of the deceased (two of which had not participated in the earlier division), brought action to force the sale of the accreted land. Deed descriptions in the grant of the seven tracts ran only to the bank of the stream, and plaintiffs contended that the accreted land did not therefore affix to the original tracts. Plaintiffs argued that each of the nine heirs owned an undivided one-ninth interest in the accreted land. The lower court so held. In reversing, the appellate court held that, generally, where a line of a grant runs to the bank of a stream and along the stream or the bank, the grant extends to the thread of the stream. Unless the description clearly excludes the space between the bank and the stream thread, all accretions belong to the riparian owner. Consequently, the seven heirs who received land along the river were entitled to the additional land which accreted to their respective tracts. (Marsee-Florida)
W70-08361

HOLYOKE WATER POWER CO V WHITTING AND CO (RESPECTIVE RIGHTS IN STREAM).
276 Mass 528, 177 NE 568-574 (1931).

Descriptors: *Massachusetts, *Mills, *Water users, *Water distribution (Applied), Judicial decisions, Legal aspects, Power head, Hydraulic structures, Water works, Canals, Pipes, Water conveyance, Water supply, Water demand, Flumes, Cavitation, Diversion structures, Dams, Riparian rights, Waterfalls, Water wheels, Diversion.

This dispute arose between plaintiff and defendant over their respective rights to the use of water and water power developed from a waterfall in the Connecticut River. Plaintiff was the owner of a hydraulic system which created water power for manufacturing purposes to be sold or leased to corporations such as defendant. Defendant was the grantee of a mill site with appurtenant water power privileges. Plaintiff alleged that defendant abused such privilege by using more than its alloted mill power and by diverting certain waters in excess of that allowed. The court held for plaintiff, and found defendant had abused its rights in the water without authority. (Barnett-Florida)
W70-08370

BIXBY V BACKUES (OWNERSHIP OF ACCRETED LANDS).
144 SW2d 112-115 (Mo 1940).

Descriptors: *Missouri, *Accretion (Legal aspects), *Boundaries (Property), *Banks, Judicial decisions, Legal aspects, Meanders, River beds, Surveys, Boundary disputes, Patents, Riparian rights, Shores, Coasts, Alteration of flow, Diversion, Relative rights, Real property.

Deeds were entered into evidence by plaintiff which purported to convey certain lands east of the Gasconade River. A controversy arose over ownership of the land evidenced in those deeds. These lands consisted of a three acre tract which was created by a change in the river's course. This change in direction was proven to be slow, gradual and imperceptible, and the lands in controversy were found to be formed by accretion to the shore land. The court stated that, under Missouri law, such accreted land belongs to the owner of the shore land to which it attaches. The deed of the shore land to plaintiff did not contain any exceptions or reservations as to accretions. It therefore presumptively carried with it all accretions so formed. As to the land in controversy, the court found title to be in plaintiff as lands accreted to shore land in which plaintiff had good title. (Barnett-Florida)
W70-08393

THE NATIONAL WATER COMMISSION,
National Water Commission, Arlington, Va.
Theodore M. Schad.
Water and Wastes Engineering, Vol 6, No 8, p 38, August 1969.

Descriptors: *Water policy, Water quality, *Water resources development, Water law, *Planning, Institutions, *Organizations, Administrative agencies.

The goals and objectives, membership, staff and organization of the National Water Commission are presented. The seven man commission was established by Public Law 90-515 and is to undertake a five year study of water resource problems in the US, the purpose of which is to provide background for policy recommendations to guide the future activity in water related fields in the US. The information will be obtained by the commissions staff, from state and federal agencies, and private organizations. The studies will encompass many water-related areas. The commissions final report to the President and Congress is due September 1973. A listing of the commission members, key staff members, and special consultants is also included. (Makela-Texas)
W70-08406

EFFECT OF MUNICIPAL WATER SERVICE POLICIES ON ECONOMIC GROWTH IN SUBURBAN AREAS,
Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
For primary bibliographic entry see Field 06B.
W70-08420

ATTITUDES AND ATTITUDE CHANGE RELATING TO WATER RESOURCES,
Georgia Inst. of Tech., Atlanta. School of Psychology.
For primary bibliographic entry see Field 06B.
W70-08421

STATE V HOLLAND (DIFFERENCE BETWEEN PUBLIC AND SOVEREIGN LAND).

10 So2d 577-592 (Fla 1942).

Descriptors: *Florida, *Ownership of beds, *Land classification, *Public lands, State governments, Local governments, Cities, Legal aspects, Judicial decisions, Legislation, Water law, Remedies, Regulation, Navigable waters, Classification, Land, Land use, Real property, Property values.

The State of Florida, on behalf of Crescent City, Florida, sought to compel the Trustees of the Internal Improvement Fund to convey certain lands to such city. Whether the city was to pay a nominal sum or a substantial price for these lands depended upon the determination of the issue of whether these lands were public lands or soverign lands. If designated as public lands, such realty would sell for a substantial sum, as opposed to the more nominally priced sovereign lands. The court stated that public lands are those which are owned by the state, subject to sale or disposition under general law, and those which have not been reserved for any partiuclar purpose. However, the court further noted that lands under navigable waters below the ordinary high water mark belong to the state, by virtue of its sovereignty for appropriate uses, and are not among the public lands of the state. The court held that the lands which were the subject of controversy were sovereign lands, which necessarily entailed conveyance for a nominal fee as authorized by state law. (Finman-Florida)
W70-08440

LAW V GULF STATES STEEL CO (DAM NOT THE PROXIMATE CAUSE OF UPLAND FLOODING).
175 So 322-326 (Ala Ct App 1937).

Descriptors: *Alabama, *Dams, *Flood damage, *Headwaters, Damages, Flash floods, Flooding, Overflow, Flood water, Judicial decisions, Floods, Backwater, Streams, Watersheds (Basins), Concrete dams, Structures, Crops, Legal aspects, Adjudication procedure, Water levels.
Identifiers: *Causation (Legal aspects).

In an action for damages, plaintiff contended that his crops were destroyed by backwater overflow from a creek dammed by defendant. Defendant contended that plaintiff's crops were damaged by a flood flowing from above and not impeded by the dam. Defendant argued that the headwaters rushing down the creek reached such a height that the crops would have been destroyed even if the dam had not existed. The appellate court held that evidence introduced to the jury for the purpose of showing the area's topography, elevations, and probable rise of water was properly admitted. The jury's determination that the dam was not a proximate cause of the destruction of plaintiff's crops was affirmed. (Snow-Florida)
W70-08444

WATER ADMINISTRATION--A SUGGESTED INSTITUTIONAL MODEL,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
Clayton K. Yeutter.

Available from the Clearinghouse as PB-193 024, $3.00 in paper copy, $0.65 in microfiche. University of Nebraska, Department of Agricultural Economics Report No 46, December 1968. 30 p, 74 ref. OWRR Project No A-008-NEB.

Descriptors: *Institutions, *Administration, *Water resources development, Institutional constraints, Political aspects, Decision making, Local governments.
Identifiers: *Water administration, *Institutional model, Water resources board, Comprehensive water plan, Externalities, Proctored market, Local water administrative agencies.

An institutional model for water administration is described which attempts to provide a basic, general framework of almost universal applicability, through the provision of the skeletal components of a water code featuring simplicity, flexibility, and localized responsibility. This institutional proposal is pyramidal in approach. At the peak is a Water Resources Board that will: (1) develop a comprehensive water plan for the state; (2) make broad policy decisions in both planning and administrationp (3) deal with water problems that are state-wide in scope; and (4) coordinate the activities of local water administrative agencies. Local organizations form the base, including streamflow, groundwater, and reservoir districts and with various combinations thereof. This institutional model might be considered a 'proctored market' model whose institutional model might be considered a 'proctored market' model whose intent is to: (1) permit most, but not all, water allocation decisions to be made by the market; (2) proctor, alter, or pre-empt the market only with respect to functions that the market cannot satisfactorily perform; and (3) localize non-market decision-making responsibilities whenever feasible. The market will not, however, resolve all the ills of water administration, hence, the need for centralized agencies designed to cope with these 'externalities'. (See also W69-08115) (Davis-Chicago)
W70-08462

THE RIO GRANDE COMPACT,
S. E. Reynolds.
In: International Law Along the Mexican, American Border, No 11, Committee on Desert and Arid Zones Research, Southwestern and Rocky Mountain Division, A.A.A.S., p 48-64, 1968.

Descriptors: *Rio Grande, *New Mexico, *Federal jurisdiction, Surface waters, Groundwater, Dams, Reservoirs, Texas, Colorado, Irrigation canals, Irrigation districts, Irrigation permits.
Identifiers: *Federal legislation, *U.S. Supreme Court, *Rio Grande Compact, *Interstate compacts, *Doctrine of equitable apportionment, Debit water, Elephant Butte Reservoir, Rio Grande Valley.

In adjudicating interstate water controversies, the U.S. Supreme Court applies the doctrine of equitable apportionment between upstream and downstream western states. A number of other economic and social factors are also involved in the Court's deliberations and the bases of decisions may be extremely involved. Alternatively, such controversies may be resolved by federal legislation throught the creation of water compacts. It is generally agreed that compacting best resolves interstate water controversies. The Rio Grande Compact of 1938 effectively established requirements and standards for the apportionment of Rio Grande Waters between New Mexico, Colorado and Texas. Three generally misunderstood aspects of the Compact are clarified: (1) The amount of water delivered between states in any given year is determined by water gauges at each supply level (2) The Compact does not effectively apportion water between New Mexico and Texas but between 2 parts of New Mexico (3) Accrued water debits do not reflect New Mexico's contributions because much of it was temporarily created by long-term water supply improvement projects within the state. (Casey-Arizona)
W70-08520

HITE V TOWN OF LURAY (CONSTRUCTION OF DEEDS AND ASCERTAINMENT OF WATER RIGHTS).

8 SE2d 369-373 (Va 1940).

Descriptors: *Virginia, *Springs, *Water users, *Patents, Cities, Legal aspects, Judicial decisions, Reasonable use, Alteration of flow, Municipal water, Natural flow doctrine, Obstruction to flow, Relative rights, Prior appropriation, Damages, Riparian rights, Riparian land, Riparian waters, Streams, Mills, Saw mills, Pipes, Easements, Condemnation, Public health.

Plaintiff city brought suit for the construction of certain deeds to determine what rights it had acquired in and to certain springs and the waters flowing therefrom. Certain mesne conveyances were examined which conveyed the property in question but which reserved certain water rights in the original grantor. The court concluded that plaintiff owned a property right in all the water in the spring except so much as was reserved in the original conveyances by the grantor, including: (1) the right to withdraw from the spring specified amounts of water; and (2) the right to the use of so much of the water flowing from the spring as might be necessary to meet the ordinary needs of the owner of the lands through which it passes. Those rights and privileges granted and reserved were found to be appurtenant to and running as covenants with the land as granted in the original conveyance. (Barnett-Florida)
W70-08525

MAJOR UNITED STATES WATER PROBLEMS ALONG THE INTERNATIONAL BOUNDARY REACH OF THE RIO GRANDE (BRAVO),
International Boundary and Water Commission, El Paso, Tex. Office of Water Control.
For primary bibliographic entry see Field 03B.
W70-08539

EMERGING LEGAL STRATEGIES: JUDICIAL INTERVENTION,
Michigan Univ., Ann Arbor.
Joseph L. Sax.
The Annals of the American Academy of Political and Social Science, Vol. 389, May 1970, p 71-76. 8 ref.

Descriptors: *Legal aspects, Management, Natural resources, Attitudes, Social values, Decision making.
Identifiers: *Legal strategy, *Judicial intervention, Environmental litigation, Policy.

Citizen-initiated environmental litigation is a response to the inability of traditional administrative agencies to accommodate to newly recognized ecological perspectives in the management of natural resources. Old-line agencies, freighted by singled-mindedness, a particular sense of mission and alignment with limited constituencies, are often unequal to the broadened perspectives which modern legislation and new public attitudes demand of them. Consequently, important policy decisions are undermined or distorted. Judicial assistance is sought to return important policy decisions to a forum in which democratic processes work more effectively. One such incipient technique is the judicial 'remand' of administrative action to the legislatures. (Davis-Chicago)
W70-08542

ENVIRONMENTAL PROBLEMS AND LEGISLATIVE RESPONSES,
National Air Pollution Control Administration, Arlington, Va.
Jack C. Oppenheimer, and Leonard A. Miller.
Annals of the American Academy of Political and Social Science, Vol. 389, May, 1970, p 77-86. 1 tab. 25 ref.

Descriptors: *Legislation, *Environmental, Conservation, Inter-agency cooperation, Administration, Management, Institutional constraints.
Identifiers: *Environmental policy, *Environmental problems.

No one national legislative policy on environmental problems emerged from the Congress at the end of 1969. Congress has reacted to environmental problems in much the same manner in which it has reacted to urban-industrial problems: it has reacted to crises. Legislative assessment of environmental problems from the late 1940's to the present arose out of, but suffers from, that of earlier legislative conservationists. Early 'conservationists' sought primarily the preservation, development, and use of natural resources. Contemporary 'environmentalists', however, are chiefly concerned with the protection and quality of man-made and natural environments for human health and welfare. The legislative environmentalists are working toward the protection of the quality of human life in an urbanized society from all sources of pollution. Some legislation has been passed for programs of research and development; for technical and financial assistance to states and localities, for federal action when other governmental levels fail to act; and for the elimination of some water, air, solid waste, noise and pesticide pollution. Numerous congressional committees and their executive agency counterparts have become involved in making and administering multiple environmental policies which, at times, overlap or are in conflict. Although this has given use to executive and legislative actions to coordinate and unify environmental policies, plans, and programs. (Davis-Chicago)
W70-08545

GILL V HEDGECOCK (BOUNDARY DISPUTE AS TO RIPARIAN LANDS ON NON-NAVIGABLE STREAM).

184 SW2d 262-264 (Ark 1944).

Descriptors: *Arkansas, *Boundary disputes, *Non-navigable waters, *Riparian land, Accretion (Legal aspects), Judicial decisions, Legal aspects, Streams, Rivers, Riparian rights, Banks, Watercourses (Legal), Land tenure, Sand pits, Gravels, Boundaries (Property), Excavation, Relative rights, Adjudication procedure, Compensation, Sands, Ownership of beds.

A non-navigable stream operated as a boundary between appellant's and appellee's lands. A sand and gravel developer, who had been removing and selling sand and gravel from the bed of the stream, originated this interpleader action to determine the boundary line between appellant's and appellee's lands and the amount of compensation due each for the sand and gravel taken from their respective lands. Appellants contended that the boundary line should be a line running in the stream equi-distant from high bank to high bank. Appellees contended that they owned the entire bed of the stream. The lower court rejected both contentions and held that the boundary was the middle thread of the stream. The appellate court affirmed holding that both appellant and appellee were riparian owners, notwithstanding the fact that appellant's lands were described in his deed as lying north of the river. The presumption is that the boundary line between riparian lands on a non-navigable stream is the middle thread of the watercourse. (Marsee-Florida)
W70-08549

STATE V AUCOIN (RIPARIAN RIGHTS TO THE BEDS OF NAVIGABLE LAKES).
20 So 2d 136-165 (La 1944).

Descriptors: *Louisiana, *Boundaries (Property), *Boundary disputes, *Ownership of beds, Drainage districts, Judicial decisions, Land tenure, Legal aspects, Legislation, Public rights, Relative rights, Riparian land, Riparian rights, Riparian waters, Prescriptive rights, State governments, Usufructuary right, Watercourses (Legal), High water mark, Navigable waters, Accretion (Legal aspects).

An early government survey had extended the boundary line of several sections across the high

vater mark of a navigable lake. Because of artifi-ial drainage, the lake had shrunk to the point vhere such boundary line was no longer traversing ubmerged lands within the sections. Defendant urchased lands described in his deed as including ll of these several sections. However, prior deeds n defendant's chain of title had described the land s including only fractional sections, the boundary unning to the edge of the lake. Plaintiff state laimed title as the sovereign to all lands included n the original government survey as part of the ake bed. Defendant claimed that, by his deed, he ad acquired title to the land which had previously een under water since his deed was for complete ections and not fractional sections as were the deeds of his predecessors in title. In the alternative, he claimed: (1) that he had acquired a prescriptive right to the dried up portion of the lake bed; and (2) that he acquired such land by accretion. The court held that prescription did not run against the state. Furthermore, regardless of descriptions in deeds, beds of navigable lakes belong to the state, and original boundaries thereof designated by government surveys are controlling. Finally, statutory rights to accreted land do not apply to land adjacent to a lake where the lake has diminished in size. (Clarke-Florida)
W70-08551

HANRAHAN V CORROU (ACTION TO RESTRAIN CITY'S PURCHASE OF WATER COMPANY'S PROPERTY AND FRANCHISE).
170 Misc 922, 12 NYS2d 536-544 (Sup Ct 1938).

Descriptors: *New York, *Cities, *Waterworks, *Administrative decisions, Water supply, Reservoirs, Pumping, Pipelines, Sewers, Judicial decisions, Legal aspects, Public benefits, Taxes, Water demand, Legilation, Administrative agencies, Utilities, Water loss, Leakage, Municipal water, Financing, Adjudication procedure, Remedies, Supervisory control (Power), Legislation.

Defendant city investigated the advisability of purchasing the property of a water company which supplied the city with water. An appointed committee recommended to the city that its best interest would be served by the purchase of such property of the water company as was used or useful for water purposes. Plaintiff taxpayer brought suit to restrain such purchase, alleging that it would be illegal and a waste of public funds. Plaintiff also alleged that the purchase would be unreasonable in that much of the company's property was useless and obsolete and would require further large expenditures for renewals and replacements of existing sewer lines and water mains. The court held that the purchase was valid in that the legislature, when it authorized the court to hear a taxpayer's suit to restrain waste by municipal officials, had not given the court the power to sit in judgment upon questions of administrative discretion. The statute allowed administrative discretion in dealing with revenue-producing municipal undertakings, including instrumentalities and properties used or useful in connection with obtaining a water supply. In light of a presumption that it was made in good faith, and absent a rebutal showing otherwise, the court would not pass upon the wisdom of the purchase. (Barnett-Florida)
W70-08554

TENNECO INC V OCAW, LOCAL NO 4-522 (INJUCTION TO PROHIBIT PUBLIC USE OF LEVEE).
234 So 2d 246-250 (La Ct App 1970).

Descriptors: *Louisiana, *Levees, *Labor unions, *Public rights, Reasonable use, Streams, Navigable rivers, Mississippi River, Usufructuary right, Public benefits, Labor, Banks, Wages, Judicial decisions, Legal aspects, Riparian rights, Riparian land, Legislation, Relative rights, Navigation, Rivers.
Identifiers: *Servitudes.

Defendant union, in connection with a strike against plaintiff employer, picketed upon plaintiff's land adjacent to the Mississippi River. Plaintiff sought to enjoin the picketing, and the lower court prohibited any picketing that obstructed free ingress and egress to plaintiff's property. However, the injunction excepted from its prohibition that part of plaintiff's property which constituted the levee of the river. Plaintiff appealed the judgment contending that picketing on the levee of a navigable stream in furtherance of a labor dispute was not a public use so as to be allowable by law. Defendant argued that picketing was within the scope of uses which public servitude imposed on riparian owners pursuant to the Louisiana Code. The appellate court held that the character of the servitude imposed by law was not for the public at large, but was only for such use as was incident to commerce or navigation on the river. The picketing on the levee was unlawful and prohibited. (Barnett-Florida)
W70-08556

MINNESOTA WATER RESOURCES BD V COUNTY OF TRAVERSE (ADMINISTRATIVE AGENCY'S STANDING IN JUDICIAL REVIEW OF ITS OWN DECISIONS).

177 NW2d 44-48 (Minn 1970).

Descriptors: *Minnesota, *Watershed management, *Administrative decisions, *Adjudication procedure, Administrative agencies, State governments, Judicial decisions, Water resources, Water law, Boundary disputes, Water resources development, Public rights, Legal aspects, Local governments.

Plaintiff property owners and county commissioners initiated proceedings before defendant state Water Resources Board to establish a county watershed district. Defendant established a watershed district, but upon plaintiffs' appeal the district court modified the watershed boundaries. Defendant then sought appellate review of the district court's judgment. Plaintiffs contended that defendant had no standing to appeal because it was essentially a judicial tribunal rather than an administrative agency and therefore not an aggrieved party. Defendant contended that it was more than an arbiter because it had authority to establish watershed districts, a non-judicial function, and that it also functioned to protect the interests of the public. Finding that the public interest was adequately represented by interested state agencies and conservation groups, the court held that defendant was essentially a quasi-judicial body rather than an administrative agency and therefore had no standing in a judicial review of its own decision. Consequently, the appeal was dismissed. (Liptak-Florida)
W70-08558

GLOBE V LOUISVILLE AND N R R (PRESCRIPTIVE EASEMENT TO FLOOD LANDS).
200 SE 259-268 (Ga 1938).

Descriptors: *Georgia, *Obstruction to flow, *Easements, *Prescriptive rights, Alteration of flow, Downstream, Natural flow, Non-navigable waters, Rainfall-runoff relationships, Legal aspects, Judicial decisions, Condemnation, Legislation, Natural flow doctrine, Riparian land, Riparian rights, Riparian waters, Watercourses (Legal), Bridge construction, Repairing, Impounded waters, Excessive precipation, Dams.
Identifiers: *Trestles (Railroad).

Plaintiff owned land below a trestle built by defendant railroad. The trestle spanned a stream which flowed through plaintiff's property. The trestle collected debris and during heavy rains dammed the stream. This embankment then broke and released the impounded water onto plaintiff's property. Plaintiff asked damages and sought to enjoin the reconstruction of the trestle to its original condition. Defendant contended that, because it had maintained the trestle for twenty-five years, it had acquired a prescriptive right to flood plaintiff's land. The appellate court held that defendant had not acquired such right. The flooding had not been continuous and uninterrupted for the required period. A riparian landowner is entitled to have water reach his land in its natural flow. The obstruction thereof so as to cause it to overflow or injure his land is a trespass. Moreover, to wrongfully turn water onto the land of another is a nuisance. If the proximate cause of the overflow was defendant's failure to properly maintain the trestle, thereby rendering it incapable of accommodating the water during heavy rains, the existence of unusual rainfall did not relieve it of liability. The order dismissing the complaint was reversed. (Price-Florida)
W70-08560

SMITH V WALLACE (TITLE TO ACCRETED LAND).

119 SW2d 813-820 (Mo 1938).

Descriptors: *Missouri, *Missouri River, *Accretion (Legal aspects), *Land tenure, Rivers, Running waters, Surface waters, Channels, Natural flow, Channel flow, Boundaries (Property), Relative rights, Islands, Judicial decisions, Water law, Channel morphology, Legal aspects.

Plaintiff, record title owner of an island in the Missouri River, sought ejectment of defendants from the island. Subsequent to plaintiff's purchase of the island, through a process of erosion and accretion, the island was greatly enlarged on the downstream end so that it extended until it reached an island owned by defendants, while the upstream portion was eroded to the point that none of the island in question was included within the boundaries described in plaintiff's record title. Plaintiff claimed title to the accreted land through adverse possession. Defendants claimed that plaintiff had no interest in the accreted land and thus no interest in the island in question since it was completely beyond the boundaries of his original purchase. The Supreme Court of Missouri ruled that a landowner, be his interest derived from record title or adverse possession, is entitled to ownership of accreted land. However, the court ruled that the questions of adverse possession and actual accretion must be determined by the jury, and since the jury in the trial court had been improperly instructed as to these issues, the judgment for plaintiff was reversed. (Barker-Florida)
W70-08569

SMITH V ARKANSAS IRRIGATION CO (STATE DELEGATION OF POWER OF EMINENT DOMAIN).
142 SW2d 509-511 (Ark 1940).

Descriptors: *Arkansas, *Condemnation, *Eminent domain, *Public benefits, Boundaries (Property), Judicial decisions, Land tenure, Legal aspects, Legislation, Proprietary power, Relative rights, State governments, Water rights, Wells, Dams, Irrigation, Irrigation water, Compensation, Adjudication procedure.
Identifiers: *Public purpose.

An Arkansas statute granted the power of eminent domain to irrigation corporations. Plaintiff irrigation corporation condemned 120 acres of defendant's land. The lands condemned were contigious to a bayou across which plaintiff proposed to construct a dam to impound water for the irrigation of rice fields. The only question on appeal was the right to condemn. The court held that the mandates of due process are satisfied if the purpose for which land is condemned is public and if the owner of the land receives just compensation. Once this is judicially determined, the legislative policy is left supreme. Evidence in this case showed that rice farming was the principal activity in the area and that an abundant supply of water suitable for irrigation was essential. Therefore, the public purpose requirement was thereby fulfilled, and the trial

court's judgment for plaintiff affirmed. (Clarke-Florida)
W70-08574

FISHER V ARKANSAS POWER AND LIGHT CO (NEGLIGENT RELEASE OF IMPOUNDED WATERS BY DAM OWNER).
For primary bibliographic entry see Field 04A.
W70-08575

STONUM V DAVIS (PASSAGE OF TITLE TO SWAMPLAND BY GRANTS AND PATENTS).

152 SW2d 1067-1072 (Mo 1941).

Descriptors: *Missouri, *Patents, *Swamps, *Federal government, State governments, Grants, Judicial decisions, Legal aspects, United States, Land tenure, Overflow, Rivers, Levees, Relative rights, Land use, Real property, Drainage, Land management, Surveys, Taxes.
Identifiers: *Adverse possession.

Plaintiff, record-title holder of the disputed lands, instituted an action to quiet title against defendant, who claimed title to such lands by adverse possession. The lands involved were overflowed swamplands which had passed from the United States to the state of Missouri under a grant taking effect in praesenti in 1850, and thereafter granted by statute from the state to the counties in 1896. Defendant went into possession in 1926 and held the lands in adverse possession against all persons. The United States issued a patent of these lands to the state in 1933 and the state issued its patent of these lands to the counties in 1934. Plaintiff alleged that the time elapsed between defendant's entry into possession and the date of issuance of the government's patents could not be included in determining the period of adverse possession since adverse possession first begins to run when the fee simple title passes out of the government. The court, in affirming the trial court's judgment for defendant, held that when defendant entered into possession the United States and the state had no interest in the lands since they had previously granted away such interest. The patents in 1933 and 1934 were merely deeds of further assurance as muniments of title declaratory of the title passing in the previous grants. (Barnett-Florida)
W70-08576

HARTVEDT V HARPST (LEGAL DESCRIPTION OF ISLANDS ENLARGED BY ACCRETION).

173 SW2d 65-70 (Mo 1943).

Descriptors: *Missouri, *Boundaries (Property), *Accretion (Legal aspects), *Islands, Boundary disputes, Judicial decisions, Land tenure, Legal aspects, Proprietary power, Relative rights, Riparian land, Riparian rights, Riparian waters, Usufructuary right, Watercourses (Legal), Banks, Navigable waters, Avulsion, Low water mark, Rivers.

In an action to quiet title, plaintiff appealed from an order granting defendant's motion to make his petition more definite and certain. The land in question was an island in the Missouri River. Plaintiff's description thereof consisted of a statement of the approximate size in acres and the approximate location by section and township. Plaintiff claimed title to the waters edge of all of said island, which had been considerably enlarged by the process of accretion. Defendant claimed that the description of the island, without reference to metes and bounds, was so vague, uncertain and indefinite as to render identification impossible. The court stated that a riparian proprietor on a navigable stream owns to the water's edge, which may be figured at and to the low water mark. The court then held that the description in plaintiff's petition was clear, definite and certain enough that there was no reasonable basis upon which the trial court could say that defendant was not advised of the precise real estate claimed by plaintiff. (Clarke-Florida)
W70-08578

TAYLOR V COLLINS (NATURAL WATERCOURSE AS A BOUNDARY LINE).
299 Ky 290, 185 SW2d 388-389 (1945).

Descriptors: *Kentucky, *Boundaries (Property), *Meanders, *Boundary disputes, Alteration of flow, Judicial decisions, Legal aspects, Real property, Land tenure, Obstruction to flow, Erosion, Streambeds, Ownership of beds, Streams, Drains, Diversion, Relative rights.

A controversy arose out of a dispute as to the location of the dividing line between two tracts of land. Appellant's deed identified the common boundary between the tracts as a straight line between a rock and a tree while appellee's deed cited the meanders of a stream as the dividing line. Appellant alleged that appellee had altered the flow of the stream, thus causing it to flow over his lands. The lower court found that the true line between the property of the parties ran with the meanders of the stream as it flowed at the time of trial, and enjoined any alteration of the flow of the stream. On appeal, appellant insisted that it was the intention of the parties' common grantor that the description in his deed be the dividing line. The court, in affirming, held that even if appellant's construction of the description in his deed was accepted, it would conflict with the recognized natural object, the creek. Under the applicable law of construction of deeds, the straight line boundary appellant urged had to yeild to the natural object boundary. (Barnett-Florida)
W70-08579

HARRIS V GRAY (RIGHT OF ACCESS TO PUBLIC ROADS).
188 SW2d 933-936 (Tenn Ct App 1945).

Descriptors: *Tennessee, *Easements, *Rivers, *Access routes, Boundaries (Property), Right-of-way, Legal aspects, Judicial decisions, Washouts, Banks, Riparian land, Roads, Streams, Relative rights.

Plaintiff owned a tract of land bounded by an uncrossable stream on one side and defendant's land on the others. Plaintiff had at one time owned the lands occupied by defendant. Plaintiff filed a bill to set up an easement of way from his land over defendant's land to allow access to a public road. The lower court held that plaintiff was entitled to an easement over defendant's land to the public road upon the theory of implied reservation based upon necessity. On appeal the court held that the rule of 'absolute necessity' did not apply in Tennessee. But by reason of all the facts, including evidence of the inability of plaintiff to otherwise cross the stream, the court found an easement arose in plaintiff's favor by reason of the fact that it was reasonably necessary to the full enjoyment of the plaintiff's land. The court held that an implied reservation of an easement for access was presumed to have been within the contemplation of the parties at the time of conveyance. (Barnett-Florida)
W70-08580

KEMP V OWEGO WATER WORKS (WATER RIGHTS IN PERPETUITY CREATED BY WATER WORK'S DESTRUCTION OF SPRING ON GRANTOR'S LAND).
45 NYS2d 794-795 (App Div 1944).

Descriptors: *New York, *Water supply, *Land tenure, *Water works, Reservoirs, Spring waters, Springs, Real property, Judicial decisions, Legal aspects, Relative rights, Water rates, Water rights, Compensation, Damages, Potable water, Water demand.
Identifiers: *Injunctions.

Plaintiffs brought action to enjoin defendant wa
works from shutting off water furnished to th
premises. Both plaintiffs' and defendant's land h
at one time been held by a common grantor.
conveying land to the water works, the grantor h
provided that, if the water works should destroy
spring situated on the grantor's retained land,
should furnish the grantor and her heirs forev
from its water works, an amount of water equal
that supplied by the spring. The spring w
destroyed when defendant constructed its rese
voir, and for over 40 years defendant suppli
water free of charge to successive owners of t
land. When defendant notified plaintiffs that th
must pay for future water, plaintiffs brought actio
Defendant contended that the language of the dee
from the grantor created only a condition su
sequent and that the right to take advantage of th
breach of the condition did not pass beyond th
heirs of the grantor. The trial court rejected th
contention finding that the deed created a cov
nant running with the land. Such covenant entitle
the lands' owners to free water in perpetuity. Th
appellate court affirmed per curiam. (Marsee
Florida)
W70-08584

6F. Nonstructural Alternatives

**FLOOD PLAIN INFORMATION, SUSQUEHANN
NA AND CHENANGO RIVERS (TRIPLE CITIES
AREA), BROOME COUNTY, NEW YORK.**
Corps of Engineers, Baltimore, Md.
For primary bibliographic entry see Field 04A.
W70-08196

**FLOOD PLAIN INFORMATION, RIDLEY
CREEK, DELAWARE COUNTY, PENNSYL
VANIA.**
Corps of Engineers, Philadelphia, Pa.
For primary bibliographic entry see Field 04A.
W70-08235

**FLOOD PLAIN INFORMATION, CROOKED
CREEK AND TRIBUTARIES, HARRISON, AR
KANSAS.**
Corps of Engineers, Little Rock, Ark.
For primary bibliographic entry see Field 04A.
W70-08238

**FLOOD PLAIN INFORMATION, PORTNEUF
RIVER AND TRIBUTARIES NEAR POCATEL
LO, IDAHO AND VICINITY.**
Corps of Engineers, Walla Walla, Wash.
For primary bibliographic entry see Field 04A.
W70-08245

**FLOOD PLAIN INFORMATION, TRANQUITAS,
SANTA GERTRUDIS AND ESCONDIDO
CREEKS, KINGSVILLE, TEXAS.**
Corps of Engineers, Galveston, Tex.
For primary bibliographic entry see Field 04A.
W70-08246

**FLOOD PROFILE STUDY, MORGAN CREEK,
LINN COUNTY, IOWA,**
Geological Survey, Iowa City, Iowa.
For primary bibliographic entry see Field 02E.
W70-08247

**FLOOD PLAIN INFORMATION, FLOYDS
FORK, JEFFERSON COUNTY, KENTUCKY.**
Corps of Engineers, Louisville, Ky.
For primary bibliographic entry see Field 04A.
W70-08260

**FLOOD PLAIN INFORMATION, POND CREEK,
JEFFERSON COUNTY, KENTUCKY.**
Corps of Engineers, Louisville, Ky.
For primary bibliographic entry see Field 04A.
W70-08281

THE NATIONAL FLOOD INSURANCE PROGRAM--A NEW ELEMENT IN WATER RESOURCE MANAGEMENT,
Federal Insurance Administration, Washington, D.C.
Theodore H. Levin.
Water Resources Bulletin, Vol 6, No 1, p 120-125, Jan-Feb 1970. 6 p.

Descriptors: Insurance, *Flood plain zoning, Floods, Flood damage, Land use, *Flood plain insurance, Flood plains, Disasters, Risks, Land development, Flood protection, Legislation, Losses, Financing, Cost sharing, Requirements, Costs.
Identifiers: Flood plain studies, Flood plain regulation, Federal assistance, Federal-state cooperation, Regulations.

The National Flood Insurance Act of 1968 became effective on Jan 28, 1969, and provides for subsidized flood insurance and a cooperative program in which the Federal Government and the private insurance industry share flood risks. The statute allows 5 yr (from Aug 1, 1968) to identify all flood plain areas having special flood hazards and 15 yr to establish flood risk zones in all such areas, and to make estimates of rates of probable flood-caused loss for the various risk zones. Flood plain areas having special flood hazards are identified by publication with map reference in the Federal Register. Any structure erected after the date of such publication is not eligible for subsidized insurance. Eligibility for the insurance requires an expression of positive interest and satisfactory assurances of interest by a community or county to comply with the land use requirements of the statute. An important purpose of the program is to encourage state and local governments to make appropriate land use adjustments to constrict land development exposed to flood damage. Initially, the insurance is available only for 1- to 4-family residential structures and their contents; studies are underway to extend the program to other kinds of properties. (USBR)
W70-08441

FLOOD PLAIN INFORMATION, QUINNIPIAC RIVER, SOUTHINGTON, CONNECTICUT.
Corps of Engineers, Waltham, Mass.
For primary bibliographic entry see Field 04A.
W70-08482

FLOOD PLAIN INFORMATION, ALLEGHENY RIVER AND OLEAN CREEK, OLEAN, NEW YORK.
Corps of Engineers, Pittsburgh, Pa.
For primary bibliographic entry see Field 04A.
W70-08505

FLOOD PLAIN INFORMATION OF ALKALI CREEK - VOLUME II, BILLINGS METROPOLITAN REGION, MONTANA.
Corps of Engineers, Omaha, Nebr.
For primary bibliographic entry see Field 04A.
W70-08506

FLOOD PLAIN INFORMATION, MARTINS CREEK, NORTHAMPTON COUNTY, PENNSYLVANIA.
Corps of Engineers, Philadelphis, Pa.
For primary bibliographic entry see Field 04A.
W70-08511

FLOOD PLAIN INFORMATION, MANITOWOC COUNTY, WISCONSIN.
Corps of Engineers, Chicago, Ill.
For primary bibliographic entry see Field 04A.
W70-08512

6G. Ecologic Impact of Water Development

CLIMATE, SURVIVAL AND THE SECOND-CLASS SOCIETIES IN PALESTINE BEFORE 3000 B. C.,
Balliol Coll., Oxford (England).
Ian Blake.
Advancement of Science, Vol 25, No 126, p 409-421, June 1969.

Descriptors: *Social change, *Water demand, *History, *Precipitation (Atmospheric), *Climatic data, Arid lands, Population, Competition, Migration, Urban sociology, Social impact.
Identifiers: *Palestine, *Archaeology, *Jordan valley.

Modern-day Palestine (Israel-Jordan) is divided into 4 climatic regions: (1) A northern moist area of 400 mm annual rainfall (2) Jordan Valley - a geomorphological depression with no rainfall but many springs and therefore fertile (3) A barren southern arid region of less than 150 mm annual rainfall (4) A marginal region in the transition area between arid and moist areas. The author contends that only very slight climatic changes could cause great changes in the productivity of the marginal region. A Pre-Pottery Neolithic society (PPN) with sophisticated tools and building structures existed throughout the 3 wetter regions from 7000-6000 B.C. and there after completely disappeared. After 5000 B.C. it was succeeded, successively, by 3 Pottery Neolithic Societies (PNi, PNii, and PNiii) of generally lesser technical sophistication. There is some evidence for middle eastern rainfall maxima in 7000, 5000, and 3000 B.C., which correlates with the origins of PPN and PNi and the peak of PNiii. PNi and PNii occupied only the moist, fertile regions, PNiii extended into the marginal region but withdrew after the onset of a new arid period around 2500 B.C. Significantly however it did not collapse, following the withdrawal as did the PPN society. It is speculated that PNiii had developed walled towns, enabling the moister regions to withstand mass migrations from the rainfall-impoverished areas, and that such climatic factors, causing upheavals, may have been significant factors in human social progress. (Casey-Arizona)
W70-08538

07. RESOURCES DATA

7A. Network Design

SOME ISOPLETH MAPS BASED ON LYSIMETER OBSERVATIONS IN THE BRITISH ISLES IN 1965, 1966, AND 1967,
Nature Conservancy, Huntingdon (England).
For primary bibliographic entry see Field 02D.
W70-08176

SPACE VARIATIONS OF PRECIPITATIONS FOR RAINAGE NETWORK DESIGN,
Agricultural Research Service, Danville, Vt. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02B.
W70-08178

THE SYNTHESIS OF SNOWMELT HYDROGRAPHS,
Maine Univ., Orono. Water Resources Research Center.
For primary bibliographic entry see Field 02C.
W70-08244

SYNTHETIC UNITGRAPHS FOR SOUTH AFRICA,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W70-08500

7B. Data Acquisition

A BURET CYLINDER FOR GRAIN-SIZE ANALYSIS OF SILT AND CLAY (WITH ALGOL-PROGRAM),
Technische Hochschule, Munich (West Germany). Sedimentology and Marine Geology Div.; and Bayerische Landesstelle fur Gewasserkunde, Munich (West Germany).
For primary bibliographic entry see Field 02J.
W70-08169

THE MEASUREMENT OF THE SIZES OF NON-SPHERICAL PARTICLES BY THE HYDROMETER METHOD,
Reading Univ. (England). Sedimentology Research Lab.
For primary bibliographic entry see Field 02J.
W70-08201

A METHOD TO STUDY THE DISTRIBUTION OF HEAVY-MINERAL GRAIN ABUNDANCE IN A TURBIDITE,
Mineral Research and Exploration Inst., Ankara (Turkey).
For primary bibliographic entry see Field 02J.
W70-08202

MEASUREMENT OF PARTICLE SHAPE BY FOURIER ANALYSIS,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 02J.
W70-08205

MEASUREMENT OF THE TOTAL SUCTION OF SOILS BY A THERMISTOR PSYCHROMETER,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W70-08220

TURBULENCE MEASUREMENTS IN LIQUIDS USING AN IMPROVED TOTAL PRESSURE PROBE,
Massachusetts Inst. of Tech., Cambridge. Hydrodynamics Lab.
Roger E. A. Arndt, and Arthur T. Ippen.
Text also in French. Journal of Hydraulic Research, Vol 8, No 2, p 131-158, 1970. 28 p, 11 fig, 15 ref, append.

Descriptors: *Turbulence, *Measurement, *Instrumentation, Pressure, Frequency analysis, Vortices, Turbulent flow, Flowmeters, Current meters, Calibrations, Gages.
Identifiers: Turbulence meters.

The performance of an instrument capable of a flat response to total pressure fluctuations in water in the frequency range 0-250 Hz is demonstrated. Measurements of turbulence in open channels and closed conduits were made as well as in boundary layers adjacent to smooth and various rough walls. When compared with hot wire measurements in air by others the performance of the instrument proved very reliable for such turbulence measurements. A design equation is presented in a form suitable for application to commercially available pressure transducers. The natural frequency estimated by this equation agrees reasonably well with the experimentally determined response. Estimates of accuracy are presented and limitations on the use of such an instrument are discussed. (Knapp-USGS)
W70-08226

PROBLEMS OF MEASURING AND EVALUATING SNOWCOVER,
Canada Department of Transport, Toronto (Ontario). Meteorological Branch.
For primary bibliographic entry see Field 02C.
W70-08242

FLUORESCENT SAND AS A TRACER OF FLUVIAL SEDIMENT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02J.
W70-08253

A NEW METHOD FOR MEASURING SHEAR STRESSES IN A HYDRAULICALLY ROUGH FLOW,
Universidad de la Republica, Montevideo (Uruguay).
O. J. Maggiolo, R. Guarga, and J. Borghi.
Text also in French. Journal of Hydraulic Research, Vol 8, No 2, p 189-217, 1970. 29 p, 10 fig, 14 tab, 10 ref.

Descriptors: *Roughness (Hydraulic), *Turbulent flow, *Shear drag, *Measurement, Instrumentation, Shear stress, Boundary processes, Pressure, Flow resistance, Boundaries (Surfaces).
Identifiers: Rough flow (Hydraulic).

In experimental hydrodynamics, methods are needed to determine shear stresses on the walls. Typical examples are all the problems on movable beds, such as critical drag of sediments, side slope stability, and scour in erodible channels. All these cases of practical interest belong to the field of hydraulically rough flow. A new method for measuring shear stress in hydraulically rough flow is evaluated. The method proposed might be applied on circular pipes, rectangular channels and plane plates with boundary layers of any thickness, since the velocity distribution law in hydraulically rough flow is the same in the three cases. It is based on the accomplishment of three measurements by means of an impact tube in the vicinities of the wall. By these three measurements and with no need of a previous determination of the roughness, it is possible to obtain the value of the shear stress on the wall and the value of Nikuradze's roughness equivalent to the given roughness.
W70-08258

THE HYDROGEOLOGIC PARAMETER MU AND A METHOD FOR COMPUTING GROUNDWATER STORAGE,
Akademiya Nauk SSSR. Institut Geologii.
Ya. M. Shilinskaya.
Transl from Dokl Akad nauk BSSR, Vol 13, No 2, p 164-168, 1969. Soviet Hydrology: Selected Papers, Issue No 1, p 89-94, 1969. 6 p, 2 fig, 2 tab, 3 ref.

Descriptors: *Groundwater movement, *Hydrogeology, *Soil water movement, *Water storage, Water level fluctuations, Storage coefficient, Saturated flow, Unsaturated flow, Capillary fringe, Water table.
Identifiers: USSR.

Methods are given for computing groundwater and soil water storage changes with fluctuating water tables. The accuracy was checked in experimental plots by sampling. (Knapp-USGS)
W70-08266

ECOLOGICAL SURVEYS FROM SPACE.
National Aeronautics and Space Administration, Washington, D.C. Office of Technology Utilization.

For sale by Superintendent of Documents, US Government Printing Office, Washington, DC 20402. Price $1.75. National Aeronautics and Space Administration Special Publication SP-230, 1970. 75 p, 46 fig, 3 tab, 7 ref.

Descriptors: *Satellites (Artificial), *Aerial photography, *Surveys, *Remote sensing, Agriculture, Forest management, Geology, Hydrology, Oceanography, Mapping.
Identifiers: *Ecological surveys, Spacecraft, Geography.

Photographs are presented and analyzed for ecologic data in a small sampling and condensation of numerous scientific and technical studies of new images and concepts of the Earth that men have acquired by venturing into space. It is intended mainly to call the attention of more specialists, such as geographers, agricultural engineers, foresters, geologists, hydrologists, oceanographers, and cartographers, to the potentialities of ecological surveys from orbiting satellites. The photographs were taken from aircraft and the Gemini and Apollo vehicles. Additional examples of space photography are available for study in other NASA Special Publications. (Knapp-USGS)
W70-08465

DOSAGE REQUIREMENTS FOR SLUG INJECTIONS OF RHODAMINE BA AND WT DYES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W70-08498

COMPARISON OF A PROPELLER FLOWMETER WITH A HOT-FILM ANEMOMETER IN MEASURING TURBULENCE IN MOVABLE-BOUNDARY OPEN-CHANNEL FLOWS,
Geological Survey, Fort Collins, Colo.
J. P. Bennett, and R. S. McQuivey.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402 - Price $3.25. In: Geological Survey Research 1970, Chapter B, US Geological Survey Professional Paper 700-B, p B254-B262, 1970. 9 p, 9 fig, 1 tab, 4 ref.

Descriptors: *Turbulence, *Flowmeters, *Anemometers, Current meters, Water measurement, Flow measurement, Rotating meters, Instrumentation, Calibrations.
Identifiers: Turbulence meters.

The hot-film anemometer may be used in measuring turbulence in large-scale movable-boundary open-channel flows if a correction is made for the drift of the velocity-voltage relation of the sensor. The propeller flowmeter may be used for making turbulence measurements in such flows if corrections are made for the frequency response and spatial averaging of the propeller. For each instrument the true power spectral density of the turbulence velocity may be calculated. Measurements of turbulence intensity and power spectral density were made with both hotfilm anemometer and propeller flowmeter in large-scale openchannel flows. The power spectral densities from the instruments are similar in shape except at the higher frequencies where effects of propeller spatial averaging appear. The efficiency of the propeller flowmeter as a device for measuring turbulence increases as the scale of the turbulence increases. (Knapp-USGS)
W70-08499

7C. Evaluation, Processing and Publication

GRAVITY INVESTIGATION OF THE WATER-BEARING STRATA IN SWAN VALLEY, MONTANA,
Montana Univ., Missoula; and Montana Water Resources Research Center, Bozeman.
For primary bibliographic entry see Field 02F.
W70-08149

AEROMAGNETIC, GRAVITY, AND ELECTRICAL RESISTIVITY EXPLORATION BETWEEN PAHALA AND PUNALUU, HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
William M. Adams, Surendra P. Mathur, and Richie D. Huber.
Available from the Clearinghouse as PB-192 807, $3.00 in paper copy, $0.65 in microfiche. Technical Report No. 28, February 1970. 62p, 11 tab, 28 fig, 15 ref, 2 append. OWRR Project B-008-HI (3).

Descriptors: *Resistivity, *Gravity studies, *Groundwater barriers, Rift zone, Cinder hills, Dikes, Infrared radiation, Borehole geophysics, Hawaii, Geophysics, Exploration.
Identifiers: Pahala (Hawaii), Punaluu (Hawaii), *Aeromagnetic exploration, Rift zone, Cinder hills.

Aeromagnetic, electrical resistivity, and gravity surveys were conducted in the area between Pahala and Punaluu, Hawaii to delineate barriers to groundwater movement. The geophysical data are interpreted and compared to determine the sectors of relatively low gradient groundwater between the barriers. In the Pahala area, two barriers to lateral groundwater movement have been located: the Kolea barrier, which trends roughly east to west, and the second barrier, associated with a 'crack' used as the Pahala dump, designated by this study as the Pahala dump barrier. The Pahala dump barrier definitely appears to terminate at the Kolea barrier. These barriers are defined by magnetic, gravity, and electrical sounding and profiling observations. In the Punaluu area, electrical sounding and profiling observations agree with the conclusions of an earlier infra-red study that a large fresh-water outflow, associated with a relatively high head of the water table, occurs. Magnetic and gravity observations agree on the presence of a skewed prismatic body with the top of the body being close to the ground surface. Two test holes have been drilled in the area. The findings verify the geophysical predictions. (Adams-University of Hawaii)
W70-08154

A GENERALIZED COMPUTER MODEL FOR STEADY-STATE PERFORMANCE OF THE ACTIVATED SLUDGE PROCESS,
Robert A. Taft Water Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05D.
W70-08165

USING SOIL MAPS TO DELINEATE FLOOD-PLAINS IN A GLACIATED LOW-RELIEF LANDSCAPE,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W70-08183

DISTRIBUTION OF ESTIMATES OF QUANTILES COMPARED BY DIFFERENT METHODS (AS APPLIED TO STREAMFLOW COMPUTATIONS),
For primary bibliographic entry see Field 02E.
W70-08270

FLOODS ON ROCK RIVER IN NORTHERN ROCK COUNTY, WISCONSIN,
Geological Survey, Washington, D.C.
James O. Shearman.
For sale by US Geol Survey, Washington, DC - Price $0.75. US Geological Survey Hydrologic Investigations Atlas HA-393, 1 sheet, 1970. Text, 7 fig, 1 map, 4 tab, 4 tab, 7 ref.

Descriptors: *Floods, *Wisconsin, Profiles, Maps, Frequency analysis, Stage-discharge relations, Discharge (Water), Flood plains, Lakes, Rivers, Streamflow, Zoning, Flood plain zoning, Nonstructural alternatives.
Identifiers: *Rock River (Wisc).

A one sheet Hydrologic Atlas discusses a 12-mile reach of the Rock River from a point 2.3 miles upstream from U.S. Highway 14 to the outlet of Lake Koshkonong. It describes potential Rock River flooding in Rock County, Wisconsin. The maximum flood for the period of record at each of 5 stream-gaging stations in the Rock River basin is tabulated. Flood frequencies are stated in terms of their recurrence intervals or in terms of their probabilities of occurrence. The regional-flood profile and the flooded area that would exist at the time of the regional-flood discharge are the basic

echnical information upon which flood-plain regu-ations are to be based. The flood profile is deter-nined by hydraulic-engineering analyses, and it is he basis for constructing the flood map. To deter-nine the regional-flood profile, over 30 flood-plain ross sections and supplemental data were ob-ained by field surveys. (Knapp-USGS)
W70-08283

FLOODS IN BEDEN BROOK BASIN IN SOMER-SET AND MERCER COUNTIES, NEW JERSEY,
Geological Survey, Washington, D.C.
Thomas G. Ross.
For sale by the US Geol Survey, Washington, DC. Price $0.75. US Geological Survey Hydrologic In-vestigations Atlas HA-378, 1 sheet, 1970. Text, 7 fig, 1 map, 1 tab, 7 ref.

Descriptors: *Floods, *New Jersey, Frequency analysis, Flood plains, Stage-discharge relations, Profiles, Maps, Discharge (Water), Hydrologic data.
Identifiers: *Beden Brook (NJ).

A one-sheet hydrologic atlas presents hydrologic data on the extent, depth, and frequency of flood-ing in the Beden Brook basin in Somerset and Mercer Counties, New Jersey. It was prepared to give individuals, organizations, and governmental agencies a technical basis for making decisions on the use of flood-plain lands. The areal extent of flooding is shown for a hypothetical 50-year flood along Beden Brook, Rock Brook, and Pike Run. Flood boundaries shown on Back Brook are those of the March 7, 1967, flood. Backwater from a 50-year flood on Pike Run is shown between stations 0 and 500 in Back Brook. Areal extent of flooding was delineated on the basis of floodmarks identified in the field and from profiles developed from these floodmarks. Depths of inundation and overflow limits of floods of lesser magnitude than those shown on the map can be estimated by using the relations presented. (Knapp-USGS)
W70-08284

BIBLIOGRAPHY AND INDEX OF GEOLOGY.
Geological Society of America, Boulder, Colo.
For primary bibliographic entry see Field 10.
W70-08472

THREE STATISTICAL PROGRAMS TO PROCESS LIMNOLOGICAL DATA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 02H.
W70-08508

08. ENGINEERING WORKS

8A. Structures

INVESTIGATION AND REPAIR OF EXISTING SEWERS,
Underwater Tel-Eye Ltd. (Canada).
For primary bibliographic entry see Field 05D.
W70-08296

SCHEME FOR THE QATTARA DEPRESSION,
Technische Hochschule, Darmstadt (West Germany).
Friedrich Bassler.
Water Power, Vol 20, No 12, p 494-498, December 1968. 2 fig, 5 ref.

Descriptors: *Reservoirs, *Pumped storage, *Hydroelectric power, *Electric power production, *Deserts, Arid lands, Environmental effects, Evaporation, Reservoir evaporation, Reservoir storage, Tunnels, Underground powerplants, Electric powerplants, Hydroelectric plants, Electric power, Transmission (Electrical), Construction costs.
Identifiers: *Egypt, *Qattara Depression, *Sahara, *Libyan Desert, *Mediterranean Sea, Area development.

Scientists from West Germany have been studying the feasibility of constructing a pumped storage power plant on the Qattara Depression of northwestern Egypt. The depression reaches a depth of 135 m below sea level, while the mountain escarpment on its northern edge attains a height of 230 m above sea level. Water would have to be brought in from the Mediterranean Sea, a distance of 80 km, but a tunnel to deliver the water to an underground power station appears feasible. During off-peak hours power could be generated under low pressure using the 60 m drop from the sea-level tunnel to the underground power station. This power could then be used to pump water to a high-level reservoir for storage. If the depression were filled to a level of -60 m and a natural basin at the +215 m level were used for water storage, then a head of 275 m would be available for peak-load power generation. Among the advantages of developing the Qattara Depression are guaranteed energy, proximity to centers of power consumption with attendant savings in transmission costs, and the potential for future area development. Economic feasibility of the 4000MW project will be determined by the cost of tunnel construction. (Carr-Arizona)
W70-08523

HYDRO POTENTIAL OF THE TEXAS WATER PLAN,
Texas Tech. Univ., Lubbock.
George A. Whetstone.
Water Power, Vol 22, No 2, p 52-53, February 1970. 1 fig, 16 ref.

Descriptors: *Texas, *Inter-basin transfers, *Pumped storage, *Hydroelectric power, *Mississippi River, Water transfer, Diversion, Water utilization, Irrigation, New Mexico, Arid lands, Semiarid climates, Electric power production, Dams, Reservoirs, Hydroelectric plants, Economic feasibility.
Identifiers: *Texas water plan.

The basic proposals contained in the Texas Water Plan are outlined and potential water power development under the project is discussed. The majority of the energy supply in Texas has never been derived from water power and conventional hydroelectric developments are unlikely to occur in the future. Pumped storage, however, may be feasible in areas of favorable topography and adequate water supply. A number of sites should be available in East Texas in connection with storage reservoirs envisioned as part of the Texas Water Plan. Other sites should exist at the pumping stations of the Trans-Texas canal. In light of this, it is quite likely that a number of pumped storage projects will be included in the plan. (Carr-Arizona)
W70-08524

FISHER V ARKANSAS POWER AND LIGHT CO (NEGLIGENT RELEASE OF IMPOUNDED WATERS BY DAM OWNER).
For primary bibliographic entry see Field 04A.
W70-08575

8B. Hydraulics

A NOTE ON THE RECOGNITION, CAUSE, AND POSSIBLE GEOLOGIC IMPORTANCE OF GROUNDWATER MICROFLOW SYSTEMS IN ALLUVIAL-CHANNEL BED-FORMS,
Wisconsin State Univ., Oshkosh. Dept. of Geology; and North Dakota Univ., Grand Forks. Dept. of Geology.
For primary bibliographic entry see Field 02E.
W70-08207

DERIVATION OF FORMULAE FOR VARIABLE LAG TIME,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 02E.
W70-08212

OPEN CHANNEL APPLICATIONS FOR DILUTE POLYMER SOLUTIONS,
Queen's University of Belfast (Northern Ireland). Dept. of Civil Engineering.
R. H. J. Sellin, and B. J. S. Barnard.
Text also in French. Journal of Hydraulic Research, Vol 8, No 2, p 219-228, 1970. 10 p, 5 fig, 12 ref.

Descriptors: *Open channel flow, *Turbulent flow, *Fluid friction, Sewers, Shear drag, Water chemistry, Water properties, Water structure.
Identifiers: Hydrodynamic drag reduction, Polymers.

The effect of long chain polymer additives on turbulent flow lessens hydrodynamic drag. In seeking practical applications of this effect work has been concentrated on ship drag reduction and on flow in pipes. Recent work has explored a possible hydrodynamic connection with the known visco-elastic properties of the polymer solutions but experimental verification is not easy to obtain because of the low concentrations of polymer solutions (as little as 1 ppm) known to exhibit drag-reducing effects. Experiments were conducted with a polyethylene oxide which is an unbranced chain molecule. Maximum flow augmentation was achieved for sewers using a dose of about 8 ppm whereas for the pipe flow, augmentation was still increasing at 20 ppm. It is suggested that Polyox or some other drag-reducing agent could with advantage be added to the storm sewer system of a town when there is danger of the system becoming surcharged. (Knapp-USGS)
W70-08257

A NEW METHOD FOR MEASURING SHEAR STRESSES IN A HYDRAULICALLY ROUGH FLOW,
Universidad de la Republica, Montevideo (Uruguay).
For primary bibliographic entry see Field 07B.
W70-08258

MOBILE BED HYDRAULICS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W70-08259

THERMAL GRADIENTS IN RIVERS AND RESERVOIRS DUE TO HEATED PLANT EFFLUENTS,
Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 05B.
W70-08423

SEPARATION CONTROL DEVICES IN DIVERGING CHANNELS,
Indian Inst. of Science, Bangalore.
B. Vasudeva Rao, and K. Seetharamaiah.
13th Congress International Association of Hydraulic Research Proceedings, Vol 1, p 113-122, Aug-Sept 1969. 10 p, 7 fig, 1 tab, 6 ref.

Descriptors: *Flow separation, *Hydraulic conduits, Hydraulic design, Hydraulic engineering, Hydraulic models, Model tests, *Transition flow, Vanes, Flow control, *Diffusers, Channel flow, Channels, Open channel flow, Hydraulics, Fluid mechanics.
Identifiers: Divergence, *Diverging sections, Velocity head, India, Splitters, Blockage effect (Hydraulic), Foreign testing.

Flow through diverging channels presents design problems because of separation phenomena in the diverging flow, resulting in low pressure recovery or velocity head recovery in the downstream section. Flow separation adversely affects the exit flow conditions and performance level of the diverging channel. Maximum effectiveness in simple diffusers is achieved with an angle of 7 deg between the diverging walls of the diffuser, but the resulting structure is very long and not economical. One method for eliminating flow separation is using vanes to change diffuser geometry so that regions of stalled flow will not form, blocking the flow. Hydraulic model tests on wide diverging channels with vanes were conducted to control flow separation and to determine the efficiency of the expansion with respect to velocity head recovery. Results indicate that increasing the uniformity coefficient of the flow downstream increases velocity head recovery and the efficiency of the expansion. An expression to evaluate pressure head recovery is derived from momentum considerations and shows good agreement with experimental values. (USBR)
W70-08452

FLOW INVESTIGATIONS IN A WATER FLOW CHANNEL AT SUBSONIC AND SUPERSONIC VELOCITIES,
A. Bolcs.
Escher Wyss News, Vol 42, No 1, p 18-29, 1969. 12 p, 20 fig, 1 tab, 9 ref.

Descriptors: *Open channel flow, Fluid flow, *Subsonic flow, Boundary layers, *Supersonic flow, Hydraulics, Thre-dimensional, Laminar flow, Two-dimensional, Open channels, Flow around objects, Hydraulic turbines, Hydraulic models, Mach number, Shock waves, Turbine blades, *Velocity, Fluid friction, Dyes.
Identifiers: *Flow patterns.

Photographic recordings of flow patterns in an open flow channel are discussed. The flow at the surface of the water is made visible by streamers of dye. The photographs of the flow around an obstacle show the boundary-layer flow caused at the channel bottom. The recordings show that the 2 flows are basically different. As a result of frictional action, a 3-dimensional flow is formed around the model in the vicinity of the channel walls; for small values of the ratio of water depth to model length, this flow pattern develops over the entire height of the layer of water. In addition to the photographs at subsonic velocities, flow patterns are shown for shallow-water flow that is analogous to supersonic flow. (USBR)
W70-08458

COMPARISON OF A PROPELLER FLOWMETER WITH A HOT-FILM ANEMOMETER IN MEASURING TURBULENCE IN MOVABLE-BOUNDARY OPEN-CHANNEL FLOWS,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 07B.
W70-08499

8C. Hydraulic Machinery

HIGH-VOLTAGE ELECTRICAL TESTING OF POWER EQUIPMENT,
GEC Power Engineering Ltd., Trafford Park (England).
A. S. Husbands.
Science and Technology, Vol 36, No 1, p 42-48, 1969. 7 p, 6 fig, 1 tab, 9 ref.

Descriptors: *Extra high voltage, *Test facilities, Laboratory tests, Laboratory equipment, *Electrical equipment, *Testing, Switchgear, Power transformers, Electrical insulators, Impulse tests (Electrical), Contamination, Standards.
Identifiers: *Foreign testing, Great Britain, High voltage, Flashover, Switching surges.

Test facilities at a British high-voltage laboratory are described. Particular reference is made to the test and development work required for testing new high-voltage equipment. The arrangement and purposes of all test devices are explained, and examples of high-voltage investigations are given. All standardized tests can be performed to demonstrate the qualities of insulation and soundness of design. In addition, special tests simulating adverse service conditions, including surge voltages and the effects of rainfall or contamination on the surfaces of insulators, can be made. The laboratory can test adequately all high-voltage components of systems rated up to 750 kv rms, and in certain cases for higher system voltages. (USBR)
W70-08447

LARGE KAPLAN TURBINES,
E. Muhlemann.
Escher Wyss News, Vol 42, No 1, p 3-10, 1969. 8 p, 11 fig, 7 ref.

Descriptors: *Kaplan turbines, Hydraulic turbines, Efficiencies, Hydraulic machinery, Turbine runners, Costs, Acceptance testing, Model tests, Performance tests, Foreign research, Cavitation, Stress, Design, Thrust bearings, Servomechanisms.
Identifiers: Switzerland, Turbine efficiency, Turbine head covers.

Two of the largest Kaplan turbine units in operation are described. The turbines were manufactured by Escher Syss, Switzerland, and are installed at Aschach plant of the Danube Electricity Co, Vienna, and the Jupia plant Sao Paulo Central Electricity Board, Brazil. Advantages of large hydraulic turbines of 8-m runner diameter are reduction in relative cost, such as cost per unit weight, and gain in hydraulic efficiency because of reduction in flow losses. Above 8-m runner diameter, these advantages drop rapidly. Performance testing of model turbines as an alternative to acceptance testing of full-scale units is discussed. Design factors for the large Kaplan units are considered. (USBR)
W70-08456

THE 'BIPLANE' BUTTERFLY VALVE, SYSTEM ESCHER WYSS,
Bruno Barp, and Herbert Grein.
Escher Wyss News, Vol 42, No 1, p 11-17, 1969. 7 p, 14 fig, 1 tab, 8 ref.

Descriptors: *Butterfly valves, *Head loss, Weight, Fluid flow, Flow separation, Velocity, Fluid mechanics, Mechanical engineering, Model tests, Foreign research, Efficiencies, Cavitation, Test procedures, Pressure, Losses, *Hydraulic valves, *Hydraulic gates and valves.
Identifiers: Switzerland, *Test results.

A butterfly valve designed for low pressure loss and optimum use of material is described. Design of a butterfly valve is based on hydraulic strength and lowest weight as well as minimum losses through the valve. Comparative weights and head losses of various full-scale butterfly valves are tabulated. Through extensive model testing, the new biplane disc-shaped butterfly valve with flow guides was developed. The tests demonstrate the superiority of the valve, particularly where large diameters are concerned. (USBR)
W70-08457

ON PROCEDURES FOR RELIABILITY EVALUATIONS OF TRANSMISSION SYSTEMS,
Power Technologies, Inc., Schenectady, N.Y.; and General Electric Co., Schenectady, N.Y.
Robert J. Ringlee, and Sheila D. Goode.
Institute of Electrical and Electronics Engineers, Transactions on Power Apparatus and Systems, Vol PAS-89, No 4, p 527-536, Apr 1970. 10 p, 8 fig, 4 tab, 19 ref, 2 append, disc.

Descriptors: Transmission (Electrical), *Reliability, Performance, Bus (Electrical), Evaluation, *Transmission lines, Forecasting, Power syste operations, Computers, Overloads, Bibliographi Analysis, Probability, *Failure (Power), Subst tions (Electrical), Circuit breakers, Analytic techniques, Power tranformers, Calculation Models.
Identifiers: *Outages.

Quantitative reliability evaluations of transmissic systems are discussed. Substantial progress h been made in perfecting methods for simulatir network power flows rapidly on digital computi machines, and the time for the general realizatic of quantitative transmission system reliabilit evaluations may be near. One limiting area appea to be practical, rapid evaluation of stability limit Techniques for predicting the frequency wit which certain transmission contingencies will occu have been known for some time. Combining rapi simulation methods with event predictio techniques may offer a practical method for ac complishing transmission system reliability evalua tions. A generalization of the concepts of the com ponent run-fail-repair life cycle and a descriptio of a step-by-step procedure for performing relia bility evaluations are included. Simple algebrai results for the prediction of frequency and duratio of transmission contingencies are obtained using the renewal process theory. Techniques describe are as feasible for hand as for machine computa tions. (USBR)
W70-08459

EVALUATION OF INSULATION AND DAMAGE OF HIGH-VOLTAGE STATOR WINDINGS,
Hitachi Ltd., Tokyo (Japan).
K. Matsunobu, and T. Inoue.
Electronic Engineering (Japan), Vol 89, No 8, p 1-8, Aug 1969. 8 p, 13 fig, 4 tab, 9 ref, append.

Descriptors: *Electric insulation, *Dielectrics, Testing, Performance, *Stators, *Electrical coronas, Electric generators, Cracks, Quantitative analysis, Electric motors, Voids, Laboratory tests, Experimental data, Foreign research.
Identifiers: Breakdown, Service life, *Electric discharges, *Electric machinery, Japan.

Breakdown of insulating materials used in high-voltage stator windings is caused by corona or treeing discharges originating from defects such as voids, cracks, or surface scratches. The dielectric strength of electric machinery is usually tested by one of several methods, but no previous study has been made on the relations between these various methods or on the relation between insulation life and breakdown voltage. Special attention is placed on local insulation damage produced inside high-voltage stator windings, and a relations between damage rate and insulation life is formulated. A quantitative analysis is presented on the effect that various test methods have on breakdown voltage, insulation life, and damage rate. Calculated results agree well with measurements. The cumulative rule seems to hold true for insulation life and is being used to predict failure rates of electronic devices. (USBR)
W70-08460

8D. Soil Mechanics

THE USE OF GRAVITY SHAFTS FOR GROUNDWATER RECHARGE - PHASE I,
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 04B.
W70-08152

DISTORTION TESTS ON DRAINED NATURAL CLAY SAMPLES,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02G.
W70-08481

8E. Rock Mechanics and Geology

GEOPHYSICAL EXPLORATION AT SMALL EARTHFILL DAMSITES,
Department of Agriculture, Fresno, Calif.
E. E. Haskell, and Dorn Dunham.
Journal of Soil and Water Conservation, Vol 25, No 2, March-April 1970, p 66-67, 5 fig, 2 ref.

Descriptors: *Terrain analysis, Trenches, Spillways, Groundwater movement, *Rock foundations, Earth dams, *Rock properties.
Identifiers: *Seismic refraction method, Backhoe digging, Auger holes, Sierra Nevada foothills, California.

When constructing core trenches and spillways at small dams it is necessary to determine the types of rocks present at various levels and the solidity of these rocks. Although hand augering and backhoe digging are adequate methods for high depth calculations, the seismic refraction method is more reliable for deeper level excavation. (Holmes-Rutgers)
W70-08429

STATUS AND TRENDS IN LOGGING,
Marathon Oil Co., Littleton, Colo.
Hilton B. Evans.
Geophysics, Vol 35, No 1, p 93-112, Feb 1970. 20 p, 16 fig, 65 ref.

Descriptors: *Borehole geophysics, Boreholes, Drill holes, *Subsurface investigations, *Logging (Recording), Wells, Exploration, Geophysics, Reviews, Bibliographies, *Rock properties, Geologic formations, Data processing, Geologic investigations, Computers.
Identifiers: *Well logging, *Geophysical logging, Analog-to-digital converter, Geophysical prospecting.

Logging service companies are attempting to provide a good selection of borehole logging devices popular with the oil industry. The introduction of new services or new devices is being limited because oil companies are standardizing the logging suites run in the various geographic operating areas. Some new techniques appear to have important uses. Standard logging suites and evaluation techniques are discussed in terms of open-hole and cased-hole devices, and measurement of rock properties. Methods include nuclear, electrical, acoustic, gravity, and magnetic logging. The use of logging methods is increasing outside the petroleum industry in exploration and evaluation of mineral deposits, groundwater, and other geological investigations. Log digitizing and computer processing are routine in major oil companies, but methods and equipment vary greatly. Commercial digitizing services are currently too expensive for extensive use, but per-log costs are declining as more companies offer competitive services. Current research and development emphasis is on pulsed neutron-spectroscopy, acoustic measurements, and digital processing techniques. Has 65 references. (USBR)
W70-08446

09. MANPOWER, GRANTS AND FACILITIES

9D. Grants, Contracts, and Research Act Allotments

WATER RESEARCH SUMMARY.
Oregon State Univ., Corvallis. Water Resources Research Inst.

Oregon State University Water Resources Research Institute Report No 3, March 1970. 164 p.
Descriptors: *Water resources, *Water Resources Research Act, *Research facilities, *Projects, *Oregon, Resource development, Laboratories, Grants, Universities.
Identifiers: *Water resources research.

Research facilities and current projects at Oregon State University in water-related subjects are listed. Water related research sponsored by the Water Resources Research Institute at other universities in Oregon is included. The subject areas are water supply augmentation, water quality, and recreational use of water. (Knapp-USGS)
W70-08473

10. SCIENTIFIC AND TECHNICAL INFORMATION

ESTUARINE RADIOECOLOGY - A BIBLIOGRAPHY OF REPORT LITERATURE,
Department of the Interior, Washington, D.C. Office of Library Services.
John M. Lattimer.
US Department of Interior, Office of Library Services Bibliography Series No 16, March 1970. 52 p, 219 ref.

Descriptors: *Bibliographies, *Estuaries, *Estuarine environment, *Radioecology, Radioactivity effects, Radioactive wastes, Radioisotopes.
Identifiers: *Estuarine radioecology.

This bibliography on estuarine radioecology lists technical reports published from 1960 through June 1969, with a few published after that date. These reports are concerned with the biological accumulation and cycling of radionuclides, radioactive sedimentation, and the effects of radiation on the biota associated with estuaries. A special feature of this bibliography is the listing of research projects in progress as of June 1969. An index of authors and a separate index of subjects is also provided. (Knapp-USGS)
W70-08470

BIBLIOGRAPHY AND INDEX OF GEOLOGY.
Geological Society of America, Boulder, Colo.

Geological Society of America Bibliography and Index of Geology Series, 1970, published by Geological Society of America, Boulder, Colorado.

Descriptors: *Bibliographies, *Geology, Documentation, Publications, Information retrieval.
Identifiers: *Bibliography and Index of Geology.

The Bibliography and Index of Geology, published in twelve monthly issues and an annual compilation, covers the earth science literature of the world. The monthly issues are divided into 21 intradisciplinary categories. The citations within each category are listed by sequentially increasing accession numbers. They consist of the bibliographic information, a Universal Decimal Classificiation number, and a group of descriptors, descriptive phrases, or keywords. The bibliographic citations are followed by Subject and Author Indexes. The Subject Index contains three-level term sets following the system devised and used by the U.S. Geological Survey. The Author Index is alphabetically arranged. The preparation of this material has been accomplished with automatic data processing equipment. The entire contents of the Bibliography are stored on magnetic tape and are part of a permanent reference file (GEO.REF). Computer sorting and printing of individual sections, or subject sets, and a 'search and retrieval' capability are being considered for the system. (Knapp-USGS)
W70-08472

MERCURY CONTAMINATION IN THE NATURAL ENVIRONMENT,
Bureau of Commercial Fisheries, Ann Arbor, Mich.; and Dept. of Interior, Washington, D.C. Office of Library Services.
For primary bibliographic entry see Field 05A.
W70-08541

SUBJECT INDEX

ABSORPTION
STUDIES ON THE METABOLISM OF PENTACHLOROPHENATE, A HERBICIDE, IN AQUATIC ORGANISMS--I. TURNOVER OF ABSORBED PCP IN TAPES PHILIPPINARIUM. (IN JAPANESE),
W70-08375 05C

ABSTRACTS
THE EFFECTS OF SUSPENDED AND DEPOSITED SEDIMENTS ON ESTUARINE ORGANISMS AN ANNOTATED BIBLIOGRAPHY OF SELECTED REFERENCES,
W70-08386 05C

ACACIAS
FOOD AND WATER REQUIREMENTS OF DORCAS GAZELLE IN THE SUDAN,
W70-08529 02I

ACCESS ROUTES
TOY V ATLANTIC GULF AND PACIFIC (LIABILITY FOR FILLING OF CREEK BED).
W70-08206 06E

HARRIS V GRAY (RIGHT OF ACCESS TO PUBLIC ROADS).
W70-08580 06E

ACCIDENTS
TOY V ATLANTIC GULF AND PACIFIC (LIABILITY FOR FILLING OF CREEK BED).
W70-08206 06E

ACCRETION(LEGAL ASPECTS)
SUTTON V TERRETT (ACCRETIONS AS INCIDENT TO RIPARIAN OWNERS WHOSE GRANT RUNS ONLY TO STREAM BANK).
W70-08361 06E

BIXBY V BACKUES (OWNERSHIP OF ACCRETED LANDS).
W70-08393 06E

SMITH V WALLACE (TITLE TO ACCRETED LAND).
W70-08569 06E

HARTVEDT V HARPST (LEGAL DESCRIPTION OF ISLANDS ENLARGED BY ACCRETION).
W70-08578 06E

ACID MINE DRAINAGE
STUDIES ON LIMESTONE TREATMENT OF ACID MINE DRAINAGE, OPTIMIZATION AND DEVELOPMENT OF IMPROVED CHEMICAL TECHNIQUES FOR THE TREATMENT OF COAL MINE DRAINAGE.
W70-08167 05D

ACID MINE WATER
SULFIDE TO SULFATE REACTION MECHANISM--A STUDY OF THE SULFIDE TO SULFATE REACTION MECHANISM AS IT RELATES TO THE FORMATION OF ACID MINE WATERS.
W70-08161 05G

EVALUATION OF POTENTIAL ACID MINE DRAINAGE,
W70-08234 05G

ACTIVATED CARBON
CLEAN WATER AND ULTIMATE DISPOSAL,
W70-08337 05D

ACTIVATED SLUDGE
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GEOLOGICAL SOCIETY OF AMERICA, BOULDER, COLO.
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